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Master of Social Work

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DISASTER MANAGEMENT

Dr. S. Sudharsan, Assistant Professor (Aided), Department of Social Work, Madras Christian College, Chennai

SYLLABI-BOOK MAPPING TABLE

Disaster Management

Syllabi	Mapping in Book
Block I: Disaster: Definition, Dimensions of Disaster, Types of Disaster **UNIT I:** Disaster: definition, dimensions of disaster, progress in vulnerability.	**Unit 1:** Disaster **(Pages 1-27)**
UNIT II: Types of Disaster: water and climate related: floods and drainage management, droughts, cyclones, tsunami, tornadoes, hurricane, hailstorms, cloudburst, snow avalanches, heat and cold waves, thunder and lightening	**Unit 2:** Types of Disasters **(Pages 28-64)**
UNIT III: Geological Related: earthquakes, landslides, mudflows, sea erosion, dam bursts and dam failures, mine fires.	**Unit 3:** Geological Related **(Pages 65-84)**
Block II: Chemical, Industrial and Nuclear Related, Phases of Disaster, Psychological First Aid, Crisis and Emergency Management **UNIT IV:** Chemical, Industrial and Nuclear Related: Road, Rail Transportation Accidents Including Waterways– Boat Capsize, ine flooding, major building collapse, serial bomb blasts, festival related disasters, electrical disasters, fires, forest fires, mine flooding, oil spills, village fires; biological related: biological disasters, epidemics, cattle and bird epidemics, pest attacks, food poisoning.	**Unit 4:** Chemical Related **(Pages 85-126)**
UNIT V: Phases of disaster (rescue, relief, rehabilitation, rebuilding). Rescue, relief phase: Need assessment, rescue and relief provisions by Army, Police, Fire services, Panchayat Raj institutions.	**Unit 5:** Phases of Disasters **(Pages 127-144)**
UNIT VI: Psychological first aid, health camps, relief center, water and sanitation issues, epidemic breakages in camps, climatic changes and seasonal variations; humanitarian concerns in relief provision; management of relief experts, volunteers, materials, equipment; standard operation procedure to deal with trigger mechanism.	**Unit 6:** Psychological **(Pages 145-167)**
UNIT VII: Crisis and emergency management: government response system in disasters– central, state, district, taluk disaster management cell; trigger mechanisms – l1, l2, l3 levels of determination of disaster; BIRMS – basic initial response management steps.	**Unit 7:** Crisis and Emergency Management **(Pages 168-178)**
Block III: Communication systems during disasters, impact : physical, social, economic, and psychological impact of disasters and housing support housing and materialistic support for the disaster survivors **UNIT VIII:** Communication systems during disasters: HAM (help all mankind) radio promotions, police wireless network, SMS, mobile services, satellite communications; warning systems in disasters.	**Unit 8:** Communication Systems During Disasters **(Pages 179-191)**
UNIT IX: Impact : Physical, social, economic, and psychological impact of disasters. Impact on the individual, family, and community. Compensation: Compensation and legal issues among the disaster survivors. Assessment of damage. Providing compensation. Corruption in compensation.	**Unit 9:** Impacts **(Pages 192-221)**
UNIT X: Housing support Housing and materialistic support for the disaster survivors. Town planning after a major disaster. Maintaining minimum standard. Livelihood and community micro planning: Impact of disaster on livelihood and economic activities. Livelihood options for the vulnerable groups Creating self-sustenance among the disaster survivors.	**Unit 10:** Housing Support **(Pages 222-241)**
Block IV: Gender Issues in Disaster, Special Needs of the Children, Adolescents and the Vulnerable Groups **UNIT XI:** Gender issues in disaster: Special needs of the women, increased vulnerability, problems of the women and care provisions; special issues of the women in human made disaster; role of the women organisations and government; special needs of the men groups and vulnerable men working with PRI for Psychosocial care of the men.	**Unit 11:** Gender Issues in Disaster **(Pages 242-251)**
UNIT XII: Special needs of the children, adolescents and the vulnerable groups; role of child care personnel for the children affected by disaster. (Teachers/ICDS); empowering caregivers after the disaster; methods of working with children affected by disaster; community care vs. institutional care after the disaster for the vulnerable/ destitute children; foster caring of the destitute children after the disaster.	**Unit 12:** Special needs of the Children and Adolescents and the Vulnerable Groups Structure **(Pages 252-272)**
Block V: Psychological Impact of Disaster in Different Phase, Capacity Building **UNIT XIII:** Psychological impact of disaster in different phase behavioral disorders subsequent to disasters including PTSD; methods of providing psychosocial care to the disaster survivors; principles of psychosocial care; techniques of providing psychosocial care; normalization model; needs of the special groups in disaster and psychosocial care.	**Unit 13:** Psychological Impact of Disasters **(Pages 273-280)**
UNIT XIV: Capacity building: of governmental, non-governmental, community based organizations, and the local community, spectrum of care, inter sectoral and coordinated care provision between organizations, disaster preparedness, disaster sub-culture, disaster resilience role of social workers in disaster services. Policies and role of government sectors: role of state, central government, UN agencies, international organisations and NGOs, in disaster management services, India disaster management plan, quality assurance in disaster management – sphere, national health policy on disaster management, disaster survivors and human rights	**Unit 14:** Capacity Building & Policies and Role of Government Sectors **(Pages 281-304)**

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UNIT I - DISASTER

Structure

1.1 DEFINITION

A disaster is an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community.

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins. (IFRC) (Drabek, 1996)

1.2 DIMENSIONS OF DISASTERS

1.2.1 Disasters

A disaster is a serious disruption of the functioning of a society, causing or threatens to cause, widespread human, material, or environmental losses which exceed the ability of affected community to cope using only its own resources (South Africa, 2002). Disasters can be sudden (flash floods) or progressive (drought). Disasters are caused due to the interaction of humans with their environment.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk (ISDR, 2002: 25).

Extreme natural phenomena do not in themselves constitute hazards. It is only when such phenomena occur in an environment where they pose a threat to human life, property, infrastructure or the environment that they can be classified as hazards. Similarly in the case of technological developments, it is only when such developments pose a danger e.g. industrial accidents, infrastructure failures. In essence, a disaster is the result of a hazard's impact on society. So the effects of a disaster are determined by the extent of a community's vulnerability to the hazard.

Hazards in themselves do not constitute disasters. The magnitude of disaster, according to Niekerk, is usually described in terms of the adverse effects which a disaster has had on lives, property and infrastructure; environmental damage; and the costs attached to post-disaster recovery and rehabilitation. Simply out, therefore, disaster risk is the product of the combination of three elements – vulnerability, coping capacity and hazard (ISDR, 2004). This interaction is illustrated in the following formula.

Disaster risk (R)=Vulnerability (V) x Hazard (H) BY Capacity (C)

Hazards are increasingly dynamic and with highly varying potential impacts. A wide range of geographical, meteorological hydrological, environmental, technological, biological and socio-political hazards can threaten livelihoods and sustainable development.

Hazards are increasingly dynamic and with highly varying potential impacts. A wide range of geographical, meteorological hydrological, environmental, technological, biological and socio-political hazards can threaten livelihoods and sustainable development.

Hazards can be classified into three broad categories:

- Natural hazards
- Technological hazards
- Environmental degradation.

It should be noted that all communities be it rural or urban are vulnerable to hazards. However, different regions will be more prone to certain types of hazards than others.

Natural hazards are those triggered by climatic and geographical variability, which is at least partly beyond the control of human activity (Palm, 1990).

Technological hazards represents dangers originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Degradation of the environment is processes induced by human behaviour and activities (sometimes combined with natural hazards) that damage the natural resource base or adversely alter natural processes or ecosystems. Potential effects are varied and many contribute to an increase in vulnerability and the frequency and intensity of hazards.

A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

- The realization of the risks
- The failure of development: result of socio-economic and political structures and processes.
- Reducing disaster means mitigating the hazard AND/OR dealing with vulnerability/capacity.

1.2.2 Emergency Preparedness

Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences.

Disaster preparedness provides a platform to design effective, realistic and coordinated planning, reduces duplication of efforts and increase the overall effectiveness of National Societies, household and community members disaster preparedness and response efforts. Disaster

Preparedness activities embedded with risk reduction measures can prevent disaster situations and also result in saving maximum lives and livelihoods during any disaster situation, enabling the affected population to get back to normalcy within a short time period.

Disaster preparedness is a continuous and integrated process resulting from a wide range of risk reduction activities and resources rather than from a distinct sectoral activity by itself. It requires the contributions of many

different areas—ranging from training and logistics, to health care, recovery, livelihood to institutional development.

International Federation approach

The National Societies should prioritize disaster preparedness and integrate it into their overall programming efforts.

Community preparedness

Disaster preparedness provides a platform to design effective, realistic and coordinated planning reduces duplication of efforts and increase the overall effectiveness of National Societies.

Early warning

Early warning systems have limitations in terms of saving lives if they are not combined with “people-centered” networks.

Better programming initiative

The better Programming Initiative (BPI) is an impact assessment tool developed by the International Federation and adapted from the Local Capacities for Peace Project (LCPP).

Vulnerability and Capacity Assessment (VCA)

Vulnerability and Capacity Assessment (VCA) uses various participatory tools to gauge people’s exposure to and capacity to resist natural hazards.

Well-prepared National Societies

Well-prepared National Societies (WPNS) is a self-assessment tool that helps National Societies recognize, prioritize and plan activities to improve their capacity for disaster management.

Contingency planning

Contingency planning aims to prepare an organization to respond well to an emergency and its potential humanitarian impact.

Training in disaster management

The aim of disaster management training is to build the capacity of staff and volunteers to improve preparedness and response at all levels before during and after disasters.

Logistics preparedness

Logistics preparedness is a key component of any disaster reduction effort. It must be based on the vulnerability and resource assessment.

(NDMA Psychosocial Care)

1.2.3 Crisis Management

Crisis management is a process designed to prevent or lessen the damage a crisis can inflict on an organization and its stakeholders. As a process, crisis management is not one thing. The purpose of crisis management is to protect the organization, sector or the stakeholders from damage and prevent or diminish the negative outcomes of crisis.

As stated, crisis management is a process with many parts and one of the crisis management models is explained as a three-stage process by Coombs. The pre-crisis stage consists of three sub stages: signal detection, prevention and crisis preparation. At this stage, if a crisis has been detected, this crisis should be prevented from taking place and prepare for crisis management. The goal is to reduce the risks that may create crisis and also be prepared strategically and tactically. In this respect, action wise, the organization at this stage is expected to have a crisis management plan that is updated regularly. The organization forms a team for managing the crisis, selects spokesperson/s and prepares draft crisis messages. The second stage is the crisis stage itself, and this stage is formed by two sub stages, which are crisis recognition and crisis containment. At this stage, the organization's response to the crisis situation, its communication with stakeholders and how the organization deals with crisis is important. This stage covers the response of the organization to what has actually happened: the crisis management plan is put into action, and the literature suggests three points which are to be quick, to be accurate and to be consistent. Support from public relations is heavily observed at this stage since they develop the messages to be sent to all stakeholder groups, making sure that the public safety is the most important aspect. The damage that is inflicted on the organization is worked on to repair it. The post-crisis stage, as the name suggests, comes after the crisis is resolved. At this stage, the organization evaluates how they dealt with the crisis. Their focus is to be better prepared for potential crises. The crisis may not be as hot as before, but still the organization scans the media and the activities of stakeholder groups. Understanding the perceptions of their stakeholder groups is vital. In the crisis management literature, there are other crisis management process models suggested. However, this three-phase model is a simpler one compared to them.

A crisis situation creates need for information and that need is fulfilled with communication. Neither the crisis management plan nor the crisis communication before, during and after a crisis should be ignored. Crisis communication addresses to both internal and external audiences affected by the crisis situations. It provides information and that information should be consistent throughout the crisis situation with the designation of one primary spokesperson. Coombs differentiates between two types of crisis communication: "crisis knowledge management" and "stakeholder reaction

management." "Crisis knowledge management" involves collecting information, analyzing the information gathered, sharing what is learned and decision-making. The "stakeholder reaction management," involves efforts to influence the organization's stakeholder groups through communication. This may be accomplished through words or what is done, the deed. It is important to understand the perception of the stakeholders' groups of the crisis situation, the organization under crisis and its response to the crisis to influence them.

1.2.4 Social Impact

Sustainable development and disaster reduction are essential preconditions for each other. Natural disaster risk is a potential factor in many development projects. Environmental hazards can affect a project area, with socio-economic consequences for the project's target populations. Development projects can increase or reduce the risk of natural disaster, through their impact on social resilience and the natural environment.

Social impacts can be characterized and defined in many ways. The following definition is widely understood and used:

"By social impacts we mean the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society."(Inter-organizational Committee on Principles and Guidelines for Social Impact Assessment, 2003).

SIA originated as a socio-economic component of environmental impact assessment (EIA), although it has since expanded and developed considerably, in developed and developing countries. SIAs can be carried out at different stages in project and policy development, from initial planning to implementation and post-implementation evaluation. In project-level assessment, typical applications include considering the likely impacts of new industrial activities, construction, land use or resource management practices. SIA often forms part of a broader social analysis or assessment, but has a distinct and more specific purpose.

As a conceptual model, SIA is equipped to take hazard and related disaster risk into account, whether these are external factors affecting a project or conditions created or magnified by the project itself. In general, SIA can be understood as a framework for evaluation of all impacts on humans and on all the ways in which people and communities interact with their socio-cultural, economic and environmental surroundings.

By providing an understanding of the community and its social processes, SIA makes it possible to:

- identify the direct and indirect social consequences of risks (i.e., the social impacts which could arise from a hazard event); and

- develop appropriate and effective mitigation mechanisms to hazards which harness community resources and recognize community reactions to events.

SIA theory accepts that social, economic and biophysical impacts are interconnected and that change in any one of these domains will lead to changes in the others. Seen in this way, SIA has clear linkages to EIA and other forms of ex-ante impact assessment, as well as with vulnerability and sustainable livelihoods analysis. Guidance on SIA makes it clear that good practice in project design and implementation is risk-averse.

However, while hazards and risk are important features of the SIA process, SIA is not specifically a risk assessment but a means of understanding and measuring human responses to situations that may be risky or threatening.

Therefore, SIA is not commonly used *by itself* as a method of analyzing hazard risks generated by a project or external to it. It is more common for a formal risk analysis or a health impact assessment (see Box 2) to be undertaken, either to complement the SIA or within a broader EIA of which the SIA is part.

1.2.5 Risk

To identify the risk of natural disasters at an individual, local or national level, it is necessary to estimate the potential magnitude and probability of natural hazards, as well as to estimate the potential magnitude and probability of natural hazards, as well as to evaluate the vulnerability of each of them. According to Keipi and Tyson (2002), vulnerability may be evaluated from various standpoints (physical, social, political, technological, institutional, environmental, cultural and educational). Vulnerability to natural disasters is the result of anthropogenic factors; that is, factors that result from the interaction between human beings and nature. Additionally, vulnerability is a consequence of the individual and political decisions that a society makes before a hazard occurs, which are evident once the disaster takes place (ECLAC-IDB, 2000).

Freeman, et al (2001), analyze the components of different types of vulnerability and cite studies that make an effort to measure the potential physical, social and economic consequences of natural phenomena. Those who concentrate on physical vulnerability analyze the impact on buildings, infrastructures and agriculture. For example, the Latin American's Council on Applied Technology publishes vulnerability studies on the earthquake resistance of 50 types of structures (ATC, 1985). Those who focus on social vulnerability estimate the impacts on especially susceptible groups such as the poor, pregnant women and infants, the handicapped, children and youths. Those interested in economic vulnerability calculate the potential impacts on economic processes and assets.

The results of the hazard analysis and of the evaluation of vulnerability are then combined to yield an estimate of risk (defined as expected loss per period) (Keipi and Tyson, 2002). A full scope evaluation of risk encompasses the appraisal of potential losses generated by the disaster and identification of those affected by the risk. The evaluation of the risk

makes it possible to develop risk management strategies with two basic components:

1. prevention and mitigation actions to reduce potential human, social or economic losses; and
2. measures to establish financial protection against the risks that cannot be reduced.

The availability of information is critical for any action aimed at reducing the impact of disasters. Projection of the likelihood of their occurrence and estimates of their impact allow decision makers to evaluate the total risk to a country, a geographical area or a specific sector, as well as to establish concrete prevention and mitigation measures and investments.

According to (Keipi and Tyson (2002), prevention and mitigation actions require a good understanding of natural threats, vulnerability and risk. For example, given the frequency of disaster events that have occurred in Latin America and the Caribbean, on many occasions, investments in prevention and mitigation in the affected countries were not adequate to withstand the natural threats (see also Charveriat, 2002).

1.2.6 Mitigation

Mitigation is the lessening or limitation of the adverse impacts of hazards and related disasters. The adverse impacts of hazards often cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures encompass engineering techniques and hazard-resistant construction as well as improved environmental policies and public awareness. (It should be noted that in climate change policy, "mitigation" is defined differently, being the term used for the reduction of greenhouse gas emissions that are the source of climate change.)

The above definition was taken from the United Nations (UN) International Strategy for Disaster Reduction (ISDR) Terminology on Disaster Risk Reduction.

Addressing Mitigation

The Mitigation addressed by discussing the following topics:

1. Vulnerability and Risk
2. Vulnerability and Risk Assessments
3. Disaster Risk Reduction
4. Mitigation Initiatives.

(Office of the Disaster Preparedness and Management (A Division of the ministry of National Security))

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective we need to take action now—before the next disaster—to reduce human and financial

consequences later (analyzing risk, reducing risk, and insuring against risk). It is important to know that disasters can happen at any time and any place and if we are not prepared, consequences can be fatal.

Effective mitigation requires that we *all* understand local risks, address the hard choices, and invest in long-term community well-being. Without mitigation actions, we jeopardize our safety, financial security and self-reliance.

- Disasters can happen at anytime and anyplace; their human and financial consequences are hard to predict.
- The number of disasters each year is increasing but only 50% of events trigger Federal assistance.
- FEMA's mitigation programs help reduce the impact of events—and our dependence on taxpayers and the Treasury for disaster relief.

FEMA's Federal Insurance and Mitigation Administration (FIMA) manages the National Flood Insurance Program (NFIP) and implements a variety of programs authorized by Congress to reduce losses that may result from natural disasters. Effective mitigation efforts can break the cycle of disaster damage, reconstruction, and repeated damage. FEMA's mitigation and insurance efforts are organized into three primary activities that help states, tribes, territories and localities achieve the highest level of mitigation: Risk Analysis, Risk Reduction, and Risk Insurance. Through these activities and FEMA’s day-to-day work across the country, communities are able to make better mitigation decisions before, during, and after disasters. (FEMA)

1.2.7 Warnings

The term 'early warning' is used in many fields to describe the provision of information on an emerging dangerous circumstances where that information can enable action in advance to reduce the risks involved. Early warning systems exist for natural geophysical and biological hazards, complex socio-political emergencies, industrial hazards, personal health risks and many other related hazards. An Early Warning System (EWS) can be defined as a set of capacities needed to generate and disseminate timely and meaningful warning information of the possible extreme events or disasters (e.g. floods, drought, fire, earthquake and tsunamis) that threatens people’s lives. The purpose of this information is to enable individuals, communities and organizations threatened to prepare and act appropriately and in sufficient time to reduce the possibility of harm, loss or risk.

Early warning is the integration of four main elements:

1. **Risk Knowledge:** Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.

2. **Monitoring and Predicting:** Systems with monitoring and predicting capabilities provide timely estimates of the potential risk faced by communities, economies and the environment.

3**. Disseminating Information:** Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, synthetic and simple to be understood by authorities and public.

4. **Response:** Coordination, good governance and appropriate action plans are a key point in effective early warning. Likewise, public awareness and education are critical aspects of disaster mitigation.

The purpose of early warning systems is to detect, forecast, and when necessary, issue alerts related to impending hazard events4. In order to fulfill a risk reduction function, however, early warning needs to be supported by information about the actual and potential risks that a hazard poses, as well as the measures people can take to prepare for and mitigate its adverse impacts. Early warning information needs to be communicated in people friendly manner in such a way that facilitates decision-making and timely action of response organizations and vulnerable groups. Early warning information comes from different meteorological offices (for weather related disasters- flood, cyclone etc.); Ministries of Health (for example, disease outbreaks) and Agriculture (for example, crop forecasts); local and indigenous sources; media sources and increasingly from Internet early warning services.

Need of Early Warning System

Early Warning for disaster reduction is a legitimate matter of public policy at the highest national levels for two main reasons:

- The first one, clearly, is public safety, and the protection of human lives.
- The second is the protection of the nation's resource base and productive assets (infrastructure and private property or investments) to ensure long term development and economic growth. Conversely, by reducing the impact of disasters, a government avoids the financial –and political- burden of massive rehabilitation costs.

Investing in early warning and other measures of disaster reduction is neither simple nor inexpensive, but the benefits of doing so, and the costs of failing to, are considerable. For instance:

- In terms of reducing economic losses, early warning and disaster preparedness ‗ pay for themselves' many times over the life of the warning system.

- The reduction of environmental losses can, if properly managed and publicized, have both long-term benefits to the economy, and short-term benefits for the administration in-charge.

- A country can strengthen its stature and influence in international relations by a good handling of ‗externalities', or indirect effects, on neighboring nations.

From a public policy viewpoint, early warning, disaster preparedness and prevention must be part of a single, well integrated process.

Communication of early warning information. An effective early warning system needs an effective communication system. Early warning communication systems are made of two main components:

- Communication infrastructure hardware that must be reliable and robust, especially during the natural disasters; and

- appropriate and effective interactions among the main actors of the early warning process such as the scientific community, stakeholders, decision makers, the public, and the media.

Many communication tools are currently available for warning dissemination such as Short Message Service (SMS) (cellular phone text messaging), email, radio, TV, and web service. Information and communication technology (ICT) is a key element in early warning. ICT plays an important role in disaster communication and dissemination of information to organizations in charge of responding to warnings and to the public during and after a disaster. Redundancy of communication systems is essential for disaster management, while emergency power supplies and back-up systems are critical in order to avoid the collapse of communication systems after disasters occur.

Community Based Early Warning System

Early warning systems have limitations in terms of saving lives if they are not combined with ―people-centered‖ networks. To be effective, early warning systems must be understandable, trusted by and relevant to the communities that they serve. Warnings will have little value unless they reach the people most at risk, who need to be trained to respond appropriately to an approaching hazard.

Community-Based Early Warning Systems (CBEWS) are anchored in the communities and managed by the communities. It is based on a "people-centered" approach that empowers individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner in a bid to reduce the possibility of personal injury, loss of life, damage to property, environment and loss of livelihood. It provides communities, practitioners and organizations involved in disaster risk management with advance information of risks that can be readily translated into prevention, preparedness and response actions. CBEWS helps to reduce economic losses by allowing people to better protect their assets and livelihood. Essential features of community-based early warning systems are:

- All community members especially the vulnerable groups should be involved at all stages of the CBEWS from designing to operating

the systems, receiving the warning messages and responding to the warning.

- Measures taken should be based on the needs of everyone in the community including the most vulnerable segments of the community.
- The community members will own the process and system.
- CBEWS measures will enhance the capacity of the community members to deal with their situation.
- Meaningful participation in the decision-making process of EWS.

Early warning systems and policy

For early warning systems to be effective, it is essential that they be integrated into policies for disaster mitigation. Good governance priorities include protecting the public from disasters through the implementation of disaster risk reduction policies. It is clear that natural phenomena cannot be prevented, but their human, socio-economic and environmental impacts can and should be minimized through appropriate measures, including risk and vulnerability reduction strategies, early warning, and appropriate action plans. Most often, these problems are given attention during or immediately after a disaster. Disaster risk reduction measures require long term plans and early warning should be seen as a strategy to effectively reduce the growing vulnerability of communities and assets.

The information provided by early warning systems enables authorities and institutions at various levels to immediately and effectively respond to a disaster. It is crucial that local government, local institutions, and communities be involved in the entire policy making process, so they are fully aware and prepared to respond with short and long-term action plans.

Key elements for successful implementation of early warning:

Understand the most likely threats, likelihood of disasters and their potential consequences

Although natural disasters are not precisely predictable, they are most often generally foreseeable. In other words, there are many areas where the occurrence of floods is likely; one does not necessarily know exactly when, but one knows they will occur sooner or later. Many natural hazards can be foreseen, or anticipated, from past experience, the analysis of current patterns of land use, or population distribution.

Establish proper priorities

To allocate scarce resources most wisely, decision makers must rely on the type of analysis above, and make the disaster management choices which have the highest value, in terms of losses avoided. One common approach is to use the expected value criteria; that is, the likelihood of an event multiplied by the potential cost of this event if it occurred. Simply stated, it is a matter of giving priority to the worst-most likely over the most benign-least likely events.

Developing institutional networks with clear responsibilities

Understanding the nature of natural hazards and related vulnerabilities, for early warning purposes, requires a combination of actors from several areas, such as science and research (including social sciences and cultural aspects), land use planning, environment, finance, development, education, health, energy, communications, transportation, labor and social security as well as national defence. On the other hand, a prompt and effective response to a disaster, based on early warning, implies that concerted action –managed by a higher authority—be taken by specific types of institutions: civil defence or public safety personnel, power and other utility agencies or companies, public health authorities, etc. at levels ranging from the cabinet minister's to the community leaders.

Establish or strengthen the legislative/legal framework and mechanisms

Just as for any other aspect of public policy, early warning systems, as well as other disaster reduction applications need to be motivated and based within governmental responsibilities, especially since response to disasters may require exceptional executive powers for a specific period of time but its success cannot be accomplished without the benefits of widespread decision making and the participation of many others.

Developing effective communication strategies

The context of early warning system communications has two aspects; the hardware aspect relates to the maintenance of lifelines, i.e. the necessity to build or strengthen robust hazard-resistant communication systems; the software aspect relates to the maintenance of relationships, i.e. the need to establish and maintain effective links and working relationships among the actors involved in the early warning communication chain.

Securing resources

A substantial amount of resources is needed to ensure monitoring, adequate early warning, concerted disaster reduction, and a return to normal life. To a great extent, the capacity to secure resources to do this versus undertaking a competing public program—depends on the quality and credibility of the overall system: understanding threats, clear priority setting and institutional networks, and appropriate legislative dialogue. (East Asia Summit Earthquake Risk Reduction Centre)

1.2.8 Evacuation

A comprehensive, coordinated and consistent evacuation process is essential as it may be required across more than one LGA. Further, consistent evacuation processes and messages need to be communicated to all residents as well as tourists and other transient populations to minimise confusion and maximise cooperation.

1.2.9 Decision to evacuate

Decision makers analyse event specific information and intelligence and make an assessment on the necessity to evacuate exposed persons. An individual can choose to self-evacuate prior to an announcement of either a LDMG coordinated voluntary evacuation or a DDC directed evacuation.

Voluntary evacuation may be coordinated and implemented by the LDMG in close consultation with the DDC. After a disaster has been declared, the decision to order a directed evacuation lies with the DDC and should be made in consultation with the LDC and based on the Evacuation Sub-plan. The LDMG/LDC has no legislative power to direct an evacuation, however may recommend this action to the DDC.

1.2.10 Recovery

Recovery refers to those programmes which go beyond the provision of immediate relief to assist those who have suffered the full impact of a disaster to rebuild their homes, lives and services and to strengthen their capacity to cope with future disasters.

Following a disaster, life-saving assistance is the most urgent need. The rapid provision of food, water, shelter and medical care is vital to prevent further loss of life and alleviate suffering. However, practical experience, backed by research, supports the view that even at this stage, relief must be conducted with a thought to the affected community's longer-term benefit and certainly should not be prejudicial to it. And as people begin to get back on their feet and rebuild their lives, aid agencies need to help them to strengthen their resilience to future hazards. Just restoring the pre-disaster status quo may inadvertently perpetuate vulnerability. Likewise, development programmes need to take into account existing risks and susceptibility to hazards and to incorporate elements to reduce them. The two approaches are interdependent, complementary and mutually supportive.

1.2.11 Psychosocial Support and Mental Health Services (PSSMHS)

Psycho-social Support in the context of disasters refers to comprehensive interventions aimed at addressing a wide range of psychosocial and mental health problems arising in the aftermath of disasters. These interventions help individuals, families and groups to build human capacities, restore social cohesion and infrastructure along with maintaining their independence, dignity and cultural integrity. Psycho-social support helps in reducing the level of actual and perceived stress and in preventing adverse psychological and social consequences amongst disaster-affected community.

Mental Health Services in disaster interventions are aimed at identification and management of stress related psychological signs and symptoms or mental disorders among disaster-affected persons and persons with pre-existing mental health problems. In addition, psycho-social support interventions are aimed at mental health and psychological well-

being, promotion and prevention of psychological and psychiatric symptoms among disaster-affected community.

The Psycho-Social Support and Mental Health Services shall be considered as a continuum of the interventions as an important component of general health services in disaster situations. Psycho-social support will comprise of the general interventions related to the larger issues of promoting or protecting psycho-social well-being through relief work, meeting essential needs, restoring social relationships, enhancing coping capacities and promoting harmony among survivors. The mental health services will comprise of interventions aimed at prevention or treatment of psychological and psychiatric symptoms or disorders.

The overall goal of Psycho-Social Support and Mental Health Services is restoration of well-being of the disaster-affected community.

Psychosocial Support and Mental Health Services (PSSMHS)

Disasters causes devastating effect on the human life, usually leaving a trail of human agony including short and long term psychosocial trauma on the survivors. Generally in any response the physical effects of survivors get immediate attention and psychosocial needs often given less importance if not intervened may lead to dysfunction and disability. Timely psycho-social support will prevent development of long term psychosocial problems and hasten the recovery of survivors. Overall goal of psychosocial support intervention would be to enhance the coping and resiliency of the community towards improving overall well-being. Psychosocial Support and Mental Health Services (PSSMHS) is one of the important cross cutting areas of DM intervention. The plan for PSSMHS shall be a component of overall planning for disaster management with an aim of providing Psychosocial Support and Mental Health Services integrated with preparedness, response, mitigation, relief and rehabilitation. The Ministry of Health and Family Welfare (MoH&FW) is the nodal ministry. The overall plan for the PSSMHS will be developed by the nodal ministry, other line ministries may prepare their plans based on the nodal ministries plans.

Preparedness Plan

A) Short term Plan:

Preparedness

Capacity development

i) Sensitizing and training (Basic and advance) on PSSMHS across identified departments, sectors and levels.

ii) Strengthening of the national, regional and nodal capacity building institutions and resource centers at district and state level.

iii) Developing PSSMHS needs assessment indicators and templates.

iv) Strengthening of District Counseling Centres under Dept of Social welfare/ Women and Child Development (WCD).

v) Map vulnerable groups and accord priority in preparedness activities.

vi) Strengthening the resource base and data management/documentation in PSSMHS.

Education & Training

i) Inclusion of Disaster PSSMHS in Post-Graduate Curriculum of Psychiatry, Psychology, Social Work, Disaster Management, Emergency Medicine and Health Education.

ii) Inclusion of PSSMHS in Under Graduate medical studies.

iii) Integrating with all training programmes in the area of Psychology, Social Work, Mental Health, Emergency Medical Response, Hospital Administration, Nursing and Paramedics.

iv) Involve and train local community volunteers in basic psychosocial support.

v) Mobilize trained psychosocial response teams national and state level.

vi) Map vulnerable groups and accord priority in preparedness activities.

Community Based Disaster Management

i) Inclusion in the CBDM Plan and training of Panchat Raj (PRI) team members.

ii) Developing awareness materials for the community.

iii) Evolve a mechanism for community outreach education programmes on PSSMHS.

Networking, Awareness other Measures

i) Enhance the network of institutions working in the field of mental health, give focus for creating PPP to augment the community resources.

ii) Take measures to increase public awareness about psychosocial care in disasters.

iii) Integrating with all training programmes in the area of Psychology, Social Work, Mental Health, Emergency Medical Response, Hospital Administration, Nursing and Paramedics.

iv) Involve and train local community volunteers in basic psychosocial support.

v) Mobilize trained psychosocial response teams national and state level.

vi) Map vulnerable groups and accord priority in preparedness activities.

B) Midterm Plan:

i) Creation of core group of master trainers at district level

ii) Strengthening public-private partnership in research & development

iii) Formation of National PSSMHS resource Inventory under national Health Resource Inventory Initiation of distance learning courses for sensitization across various categories of disaster management stakeholders.

iv) Development and standardization of uniform training packages for different designated target groups.

v) Initiation of distance learning courses for sensitization across different categories of disaster management stakeholders.

vi) Incorporation of PSSMHS trainings in DMHP, district health and hospital plans.

C) Long term Plan:

i) Intensive Post Graduate / Post Graduate Diploma courses in PSSMHS.

ii) Streamlining of institutions and their activities

Psychosocial Support and Mental Health Services (PSSMHS)

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National Disaster Management Guidelines on Psycho-social Support and Mental Health Services (PSSMHS) in Disasters

Ten important components of the guidelines

1. Integration of PSSMHS into various health programmes, NMHP, DMHP and evolving of legal instruments necessary for implementation of

such policies under the guidance of National subcommittee on PSSMHS constituted by the Ministry of Health & Family Welfare (MoH&FW).

2. Development of skilled and competent human resource at all levels with the help of nodal institutions through standardized training practices.

3. Mainstreaming the knowledge about preventive and mitigation strategies for adverse psycho-social effects of disasters into education system. Training of Community level workers, NGOs and various professionals for providing PSSMHS in the aftermath of disasters.

4. Normalization of survivor's psychological impact could be hastened by providing Psychosocial First Aid, subsequently psychosocial support in relief camps. Later provision of psycho-social support during rehabilitation and rebuilding phase would be integrated in to the overall community development interventions.

5. Research and development to develop effective intervention should focus on community needs, integration of professional referral system with existing community best practices, vulnerability and epidemiological factors that compounded the psycho-social impact on any emergency.

6. Systematic documentation, procedures to enhance community participation, elements of psycho-social support and mental health services in deliverables like relief, transportation, care of vulnerable groups, psycho-social first aid supported by adequate infrastructure will be undertaken as planned objectives.

7. Inclusion of PSSMHS in hospital disaster management planning, effective communication and networking, counselling session areas, pooling of resources amongst network of health care services and identification of all the critical issues in state / district health disaster management planning.

8. Identification of designated institutions for training under Disaster Mental Health Programme and models of Public-Private Participation will be developed, tested and practiced.

9. Long term management of mental health interventions will be undertaken through standardized and structured need assessment tools followed by scientific studies, evaluation and development of specific intervention modules thereupon

10. Adoption of international best practices, provisions for special care to vulnerable groups, care to care givers, role of PSSMHS providers in all phases of disaster management cycle based on 'all hazard' disaster management approach

Emotional Support during Disaster

Disaster affects everyone, whether you are in the place of disaster or witnessing it. It is normal that routine life is disturbed in disaster and

people undergo different type of difficulties but differ in their reactions like fear, shock, worry and crying. These reactions are normal to a difficult situation like disaster and everyone needs some support. There is no right or wrong way to react, some people cry when they are sad, others may remain silent. There are simple methods available to overcome these difficulties by following easy dos and don’ts as under:

Do's

- Have your meal in time. Have plenty of water.
- Follow your sleep pattern and take adequate rest.
- Spend time together with your family, relatives and friends.
- Share your feelings, fears and concerns with your parents, teachers/ elders.
- Talking or hanging out with others can help you feel better.
- Help your family in household work.
- Resume playing sports or exercise daily.
- Spend time in recreational activities like listening to music, drawing, reading etc.
- Restart going to school as soon as possible.
- Resume prayers, visiting places of worship near your home.
- Take care of your pets and feel the goodness of caring.

Don’ts

- Do not skip your food.
- Do not awake till late night.
- Do not stay aloof.
- Limit watching TV and Images of disaster.
- Do not take alcohol, tobacco products like Cigarettes &Gutka.
- Do not drop out of school.
- Do not go away from your family.
- Do not believe in rumours.
- Do not make fun of others or friends over their reactions.

Who are all can help you

- Family
- Relatives.
- Teachers.
- Close friends and their family members.
- Classmates or others of your age who have had similar experience like yours.
- Doctors & government officers.
- Government helpline, web sites, bulletin boards.
- Listen to other person and respect his/her feelings. Encourage friends and class mates to seek support from adults. Help others; it will make you feel good.

1.3 PROGRESS IN VULNERABILITY

Humanity has long sought to explain and understand why environmental processes and phenomena contribute to and interfere with development processes, frequently through the terms and concepts of 'vulnerability' and 'resilience'. Many proven ideas and approaches from development and disaster risk reduction literature are not fully considered by contemporary climate change work. This chapter describes the importance of older vulnerability and resilience research for contemporary investigations involving climate change, suggesting ways forward without disciplinary blinkers. Vulnerability and resilience as processes are explored alongside critiques of the post-disaster 'return to normal' paradigm. The importance of learning from already existing literature and experience is demonstrated for ensuring that complete vulnerability and resilience processes are accounted for by placing climate change within other contemporary development concerns.

Vulnerability refers to the propensity to be harmed, in this case by a hazard, and to be unable to deal with that harm alongside the social processes creating and maintaining that propensity. Vulnerability encompasses human decisions, values, governance, attitudes, and behaviour forming situations in which hazards could potentially cause harm. Harm might be casualties, social and business interruption, and property damage.

Measures to tackle vulnerability could be technical, such as indoor climate control to avoid freezing or overheating during temperature extremes. Measures to tackle vulnerability are more often social. Examples are resource allocation to make one's own choices regarding vulnerability and political systems giving people options for holding leaders accountable when vulnerability reduction measures are not enacted. Most often, social and technical vulnerability reduction measures are intertwined, because social conditions permit which technical measures to be implemented and their effectiveness.

Building codes illustrate. The technical dimension of writing a building code for various materials and construction techniques in which structures will not collapse in high-magnitude, shallow earthquakes involves long-established knowledge. The social tasks of promulgating, monitoring, and enforcing a building code with these provisions, alongside providing adequate training opportunities and accountability for design professionals, takes much longer and requires many more resources (Bosher 2008; Lewis 2003; Spence 2004). These tasks are part of development processes linked to education, governance, and social services, and they have not been fully solved.

Consequently, development decisions creating and perpetuating vulnerability are the root causes of disasters, not environmental phenomena which sometimes become hazardous. From this vulnerability viewpoint, disasters are not 'natural', neither in the sense of being from nature nor in the sense of being normal and acceptable. The focus on human actions, behaviour, decisions, attitudes, and values leading to vulnerabilities which

cause disasters, with the implication that disasters are not 'natural', is now embedded in the disaster-related development literature (e.g. Hewitt 1997; Lewis 1999; Mileti et al. 1999; Oliver-Smith 1986; Steinberg 2000; Wisner et al. 2004). It is also accepted by development policy makers and practitioners (e.g. Global Network of Civil Society Organisations for Disaster Reduction 2009, 2011; Turcios 2001; UNISDR 2002).

(Learning from the history of disaster vulnerability and resilience research and practice for climate change, 2016)

Vulnerability describes the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include:

- poor design and construction of buildings,
- inadequate protection of assets,
- lack of public information and awareness,
- limited official recognition of risks and preparedness measures, and
- disregard for wise environmental management.

Vulnerabilities is a set of prevailing or consequential conditions resulting from physical, social, economic and environmental factors, which increase the sustainability of a community to the impact of hazards (ISDR 2002: 24). It can comprise of physical, socio-economic, environmental and/or political factors that adversely affect the ability of communities to respond to events (Jegillos, 1999). Blaike et al (1994) is of the opinion that vulnerability is the characteristics of person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a hazard.

Vulnerability can be expressed as the degree of loss resulting from potentially damaging phenomenon or hazard (Niekerk, 2002). In other words, vulnerabilities can be measured by the level of fatality i.e. amount of deaths, losses of properties or cash etc. Population increases due to high birth rate and the lack of good governance do make communities in developing nations to be highly vulnerable to hazards.

The community and its members may or may not be willing participants in contributing to or tolerating the conditions leading to vulnerability. Taken together, they create a dynamic mix of variables, each of which results from a continuous process. Vulnerabilities can be physical, social or attitudinal and can be primary or secondary in nature. If there are positive factors, that increase ability to respond to needs effectively or which reduce susceptibility, they are considered capabilities or coping mechanics. (Raheem A. Usman, F.B. Olorunfemi, G.P. Awotayo, A.M. Tunde and B.A. Usman, 2013)

Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure.

However, in common use the word is often used more broadly to include the element's exposure.

The above explanation was taken from the United Nations (UN) International Strategy for Disaster Reduction (ISDR) Terminology on Disaster Risk Reduction. Follow the link to look up other terminologies.

There are four (4) main types of vulnerability:

1. Physical Vulnerability may be determined by aspects such as population density levels, remoteness of a settlement, the site, design and materials used for critical infrastructure and for housing (UNISDR).

Example: Wooden homes are less likely to collapse in an earthquake, but are more vulnerable to fire.

2. Social Vulnerability refers to the inability of people, organizations and societies to withstand adverse impacts to hazards due to characteristics inherent in social interactions, institutions and systems of cultural values. It is linked to the level of well being of individuals, communities and society. It includes aspects related to levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, customs and ideological beliefs and overall collective organizational systems (UNISDR).

Example: When flooding occurs some citizens, such as children, elderly and differently-able, may be unable to protect themselves or evacuate if necessary.

3. Economic Vulnerability. The level of vulnerability is highly dependent upon the economic status of individuals, communities and nations The poor are usually more vulnerable to disasters because they lack the resources to build sturdy structures and put other engineering measures in place to protect themselves from being negatively impacted by disasters.

Example: Poorer families may live in squatter settlements because they cannot afford to live in safer (more expensive) areas.

4. Environmental Vulnerability. Natural resource depletion and resource degradation are key aspects of environmental vulnerability.

Example: Wetlands, such as the Caroni Swamp, are sensitive to increasing salinity from sea water, and pollution from storm water runoff containing agricultural chemicals, eroded soils, etc.

(Office of the Disaster Preparedness and Management (A Division of the ministry of National Security))

Vulnerabilities are systemic conditions that adversely affect, destabilize or erode ecological resilience (Gunderson, 2010). In fact, high degrees of vulnerability create favourable conditions for shifts in the adaptive cycle

(Holling, 2004). Embracing change and adaptation led many researchers in the field of adaptive systems to replacing the term 'recovery' with 'renewal', 're-organization' or 'regeneration' (Folke, 2006). In its current form, the concept of disaster resilience is less influenced by ecological resilience than by research in the social sciences and engineering resilience. Over the past two decades, vulnerability evolved from sustainability, quality of life and environmental justice research (Cutter, 1996). Similar to resilience, there are many definitions of vulnerability, which vary by context (e.g. hazard mitigation planning, livelihood studies, food security, climate change, etc.) and academic discipline (Cutter et al., 2003; Adger, 2006; Eakin and Luers, 2006; Gallopín, 2006). Broadly defined, vulnerability considers the 'characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard' (UNISDR, 2009). According to this interpretation, vulnerability is a product of 14 exposure, sensitivity and coping mechanism, which reflects pre-existing conditions (Adger, 2006; Oliver-Smith et al., 2012). It is therefore a fairly static concept, unlike ecological resilience.

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. Define Disaster

ii. Expand a) PSSMHS and b) VCA

iii. What is Well-prepared National Societies

iv. Why capacity development is important?

v. What are the emotional supports that can be given during disaster?

vi. What is 'Social Vulnerability'?

1.4 LET US SUM UP

This chapter gives an overview about the disaster. A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk. In this chapter we have discussed about the background of disaster, with their dimensions, with the clear cut idea of emergency preparedness during the case of crisis management. The impact at various aspects and situation, damages and the do's and don'ts of emotional support during disaster is been discussed. The in addition to it the warning system, Policies, Public safety, Recovery, Mitigation, Long term effects has be explained well in this chapter.

1.5 UNIT END EXERCISE

1. What is crisis management? Explain in brief.
2. What is the need of Emergency preparedness
3. Write a note on 'Mitigation'.
4. Discuss the long term effect of disaster.
5. Explain the National Disaster Management Guidelines on Psycho-social Support and Mental Health Services (PSSMHS) in Disasters?
6. Discuss about the 'Progress in Vulnerability'.

1.6 ANSWER TO CHECK YOUR PROGRESS

(i) A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins. (IFRC) (Drabek, 1996)

(ii) a) PSSMHS is Psychosocial Support and Mental Health Services

b)VCA is Vulnerability and Capacity Assessment

(iii) Well-prepared National Societies: Well-prepared National Societies (WPNS) is a self-assessment tool that helps National Societies recognize, prioritize and plan activities to improve their capacity for disaster management.

(iv) Capacity development is important for, a) Sensitizing and training (Basic and advance) on PSSMHS across identified departments, sectors and levels. b) Strengthening of the national, regional and nodal capacity building institutions and resource centers at district and state level.

(v) Listen to other person and respect his/her feelings. Encourage friends and class mates to seek support from adults. Help others; it will make you feel good.

(vi) Social Vulnerability refers to the inability of people, organizations and societies to withstand adverse impacts to hazards due to characteristics inherent in social interactions, institutions and systems of cultural values.

1.7 SUGGESTED READINGS

Alternative Economic Survey, 2004-05, Danish Books, New Delhi.

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UNIT II - TYPES OF DISASTERS

Structure

2.1 WATER AND CLIMATE RELATED

2.1.1 Floods and Drainage Management

Flood control refers to all methods used to reduce or prevent the detrimental effects of flood waters. Some of the common techniques used for flood control are installation of rock berms, rock rip-raps, sandbags, maintaining normal slopes with vegetation or application of soil cements on steeper slopes and construction or expansion of drainage channels. Other methods include levees, dikes, dams, retention or detention basins. After the Katrina Disaster that happened in 2005, some areas prefer not to have levees as flood controls. Communities preferred improvement of drainage structures with detention basins near the sites.

Causes of Floods

Floods are caused by many factors: heavy precipitation, severe winds over water, unusual high tides, tsunamis, or failure of dams, levels, retention ponds, or other structures that contained the water. Periodic floods occur on many rivers, forming a surrounding region known as the flood plain.

During times of rain or snow, some of the water is retained in ponds or soil, some is absorbed by grass and vegetation, some evaporates, and the rest travels over the land as surface runoff. Floods occur when ponds, lakes, riverbeds, soil, and vegetation cannot absorb all the water. Water then runs off the land in quantities that cannot be carried within stream channels or retained in natural ponds, lakes, and man-made reservoirs. About 30 percent of all precipitation is in the form of runoff small and that amount might be increased by water from melting snow. River flooding is often caused by heavy rain, sometimes increased by melting snow. A flood that rises rapidly, with little or no advance warning, is called a flash

flood. Flash floods usually result from intense rainfall over a relatively small area, or if the area was already saturated from previous precipitation.

Severe winds over water

Even when rainfall is relatively light, the shorelines of lakes and bays can be flooded by severe winds—such as during hurricanes—that blow water into the shore areas.

Unusual high tides

Coastal areas are sometimes flooded by unusually high tides, such as spring tides, especially when compounded by high winds and storm surges.

Effects of Floods

Flooding has many impacts. It damages property and endangers the lives of humans and other species. Rapid water runoff causes soil erosion and concomitant sediment deposition elsewhere (such as further downstream or down a coast). The spawning grounds for fish and other wildlife habitats can become polluted or completely destroyed. Some prolonged high floods can delay traffic in areas which lack elevated roadways. Floods can interfere with drainage and economic use of lands, such as interfering with farming. Structural damage can occur in bridge abutments, bank lines, sewer lines, and other structures within floodways. Waterway navigation and hydroelectric power are often impaired. Financial losses due to floods are typically millions of dollars each year.

Control of Floods

Some methods of flood control have been practiced since ancient times. These methods include planting vegetation to retain extra water, terracing hillsides to slow flow downhill, and the construction of floodways (man-made channels to divert floodwater). Other techniques include the construction of levees, dikes, dams, reservoirs or retention ponds to hold extra water during times of flooding.

Methods of Control

In many countries, rivers prone to floods are often carefully managed. Defences such as levees, bunds, reservoirs, and weirs are used to prevent rivers from bursting their banks. When these defences fail, emergency measures such as sandbags or portable inflatable tubes are used. Coastal flooding has been addressed in Europe and the Americas with coastal defences, such as sea walls, beach nourishment, and barrier islands.

A dike is another method of flood protection. A dike lowers the risk of having floods compared to other methods. It can help prevent damage; however it is better to combine dikes with other flood control methods to reduce the risk of a collapsed dike.

A weir, also known as a low head dam, is most often used to create millponds, but on the Humber River in Toronto, a weir was built near Raymore Drive to prevent a recurrence of the flooding caused by Hurricane Hazel in 1954, which destroyed nearly two fifths of the street.

(Flood Control and Disaster Management)

Developing an Integrated Flood and Drainage Management System

The vision for any city (in Asia) must include an environment-friendly, low-carbon, integrated and inclusive development. Rapid urbanization in combination with climate change and extreme weather conditions lead to challenges in handling surface water and drainage. Failure may lead to impacts on fresh water resources, loss of property and livelihood and in its extreme conditions, and death due to flooding. Stagnant water leads to mosquitoes breeding and spreading of diseases. In cases of combined network for sewage and surface water drainage, the risks of environmental and health impacts are increased.

The surface water/storm water management system should make use of existing infrastructure (if any) and build on sound visions, policies, strategies and plans, not limited to drainage management but all sectors that influence the performance of such a system. The proposed investment project must also be based on a sound policy and planning framework and be within the relevant regulatory framework. In case the framework is not adequate or threatens the successful implementation of the project, the PFS should at an early stage identify the key issues and determine how they can be solved. Based on baseline data and professional judgment where data are not available, an overall assessment of the current flood and drainage management, strengths, weaknesses and areas for intervention, should be made

The PFS should address the following key considerations in an integrated system:

Service provision to all

The provision of flood protection and storm water drainage network can generally not be provided on an exclusionary basis to individual households, thus the service provision is considered to be an area-based public good. This includes the practice of using the public drainage network to remove any liquid (and solid) waste, for a wide range of domestic and industrial activities. However, the lack of such a system,

especially during extreme loads, may have serious and direct impacts on people's property, livelihood, and health. It is vital that water from rainfall (precipitation), referred to as surface water or storm water is handled properly in an urban area in a way that it does not interfere with the functions of the city and provision of other services. It is equally important that sewerage and wastewater are handled and treated according to its properties, and in a manner that does not interfere with the storm water system.

Integrated water management and coordination with other development

The PFS should focus on urban water and how drainage should be handled in an urban setting. However, water management is often a regional or even transnational issue that cannot be handled in isolation by a local government unit. The behavior of the water will depend on the water catchment area and its geophysical conditions, a river basin, proximity to mountains or coastal plains, built or rural environment, soil conditions, erosion, and climate, among others. Flood mitigation in one area may also lead to flooding in another. Thus, the PFS must be based on Integrated Water Resources Management (IWRM) or Integrated River Basin Management (IRBM) and make use of existing studies, to the extent that it is reasonable and applicable to the studied urban area. This includes the need for close coordination with other local, regional, or national government stakeholders. The PFS may suggest projects that will require involvement by external stakeholders, e.g. riverbank rehabilitation or storage dams. Temporary storage or leveling of water in upland of catchment area involves a larger jurisdiction. Uneven distribution downstream may also cause conflicts between stakeholders in the same river basin or water catchment area.

Water management is also a highly cross-sectoral issue in terms of local government offices, since it may combine issues on drinking water, sewerage, and drainage and has impacts on the whole society. The functionality of a drainage system is also closely linked to solid waste management since lack of collection services and other waste related issues causes blockage in the drainage canals. As this is all related to climate change, projections on changed precipitation must also be taken into account. Thus, the proposed projects in the PFS should be an integrated part of the whole system in harmony with other infrastructure development. The PFS must examine planned development, land use, urbanization, and urban growth pattern to design for future capacity needs and to conduct risk analysis/disaster management studies.

Traditionally, flood management projects have often been based on the assumption that any water flow can be controlled and that flooding must be a very rare event. For a storage dam, for instance, the investments are

usually very high in terms of costs for material and construction works, and the investment and land use is locked. There is a great risk of negative environmental and social impacts in the dam area and other areas affected by the project. The flood return periods should determine the design, but the PFS should, where applicable, open up for a different approach where improved natural infiltration in green urban spaces or flood-resistant housing or roads would allow people to stay in a wetland area where the rise of the river has always been a natural part of that habitat.

Land use

The proposed flood and drainage management project must be consistent with land use plans. Special attention should be given to disaster management plans and risk assessments, other systems in place to accommodate large water flows within the city, and the types of land use affected by flooding. Future land use and the potential risk of locating a storage dam in an area that is vital to agriculture must, in the future, be considered. Any conflict in land use as well as reduced value of land should be addressed.

Developing an Inclusive Flood and Drainage Management Project

The basis for an inclusive project would be to identify and invite all stakeholders to actively participate already during the planning process and to make them, particularly the poor, benefit from the project components. Gender aspects are crucial—women and children are more vulnerable to the adverse impacts of pollution, such as the contamination of a water source due to flooding or the fact that they may have to walk far to find uncontaminated water supply. The PFS should analyze how lack of drainage or the occurrence of floods affect people, their health, livelihood, limitations in land use and urban growth, and how the proposed project can contribute to an inclusive, safe development. Employment opportunities tied to project components should be examined. If relocation is considered, disruption in basic services to the affected population must be examined and measured to minimize such disruption. The overall aim is to develop a sustainable flood and drainage management system that is accessible in all areas by stakeholders, regardless of income level, gender, etc. However, it may not be possible or financially viable to design a system that could accommodate and eliminate all possible water flows in extreme weather conditions or to assume that people are willing to be relocated from flood prone areas. The PFS should discuss alternative solutions and take into account the possibilities to readjust the developed areas including formal and informal settlement to accommodate flooding.

Ensuring Environmental Sustainability

Flood and drainage management projects would typically aim at improving the environmental and health conditions, including reducing the risk of human casualty. Such projects are often labeled as adaptation measures for extreme weather conditions due to climate change. However, there are many other factors and every day scenarios that also affect the urban area's capability to cope with precipitation and surface water. The PFS should make an assessment of the impacts or risks associated with the present situation and how this will change after proposed project implementation. The objective of the proposed PFS interventions is to maximize the positive impacts and minimize the negative ones, if any.

Most infrastructure projects would eventually require the preparation of an environmental impact assessment (EIA) as a basis for an environmental or similar permit. At the PFS stage, a rapid environmental assessment (REA) or a rapid environmental impact assessment (REIA) may be required. It is also vital that the requirements and the time frame for a full-blown EIA are identified already during the PFS stage to avoid delays in downstream work and unexpected investments costs for environmental protection measures. For flood management, the risk analysis is crucial and available plans or regulatory framework on disaster management and preparedness must be carefully studied.

In terms of reducing possible adverse environmental impacts, the process is similar to that adopted for social assessment. The proposed investments and facilities should be screened to determine (i) potential environmental impacts in terms of noise and pollution to communities, and (ii) potential impacts on water resources, forest resources, biodiversity, etc. as set out in ADB's environmental checklist. Mitigation measures should be formulated and costed. The implications of these measures should be included in the financial assessment and governance arrangements of the project. This includes the assessment of any positive or negative impacts related to climate change.

Ensuring Good Governance

The institutional arrangements for implementing the project must be clearly described and agreed with the client government. The ability to successfully implement almost any infrastructure project, including achieving social and environmental benefits, avoiding and mitigating adverse impacts, and achieving financial sustainability, depends on a sound governance structure.

The PFS must include the following:

(a) Discussion of organizational options for design, construction/ commissioning, and operation, including the possibility of PPP options.

Where such options are pursued, the organization structure for transparent oversight, monitoring, and regulation of private operations needs to be considered. A monitoring system with clear and measurable key performance indicators must be discussed. In terms of services integration, the arrangements for coordination across sectors and facility providers need to be described. Stakeholders must be involved at an early stage, and their continued influence and input should be secured and institutionalized for the whole project period.

(b) Consideration of how, and with what incentives, will the existing institutions and stakeholders change to the proposed arrangements.

(c) Consideration of the legal basis of each involved organization, its sources of revenue and responsibilities for expenditures (the two must match), and the hierarchy of authority across organizations (the legal basis of coordination). For flood and drainage management projects, good governance would include securing system performance and O/M budget, particularly considering the lack of user fees or other direct revenues, and public (and all other water users') awareness and collaboration, particularly in a crisis situation and its aftermath.

Institutional Strengthening

The PFS team must at an early stage in the project

(i) identify water rights and water governance boundaries,

(ii) identify and assess the valid regulatory framework for flood and drainage management (possibly including wastewater management) and other aspects relevant to the terms of reference, and

(iii) identify the legally appointed actors in the area as well as the actual operators and stakeholders, which may be in a relatively large geographical area depending on the water catchment area. Institutional strengthening as well as the overall sustainability of the project will benefit from a closer interdepartmental interaction.

The client, supported by the PFS team, shall then design a reference group or other structure and a communication strategy to ensure participation by the key stakeholders throughout the whole project period. Such a process will improve institutional capacity by fostering dialogue, setting joint priorities, and coordinating approaches to investment. Closer dialogue will enable faster and more accurate fact-finding and a possibility (for the local government) to elaborate on a better internal structure including the extended life of the reference group after the finalization of the project.

Capacity Development

The PFS must identify all stakeholders and their respective responsibilities and suggest a capacity development program that will match proposed projects and measures. The overarching goal is to create a safe and sustainable system and ensure that investments in the sector are properly

handled. This includes technical and environmental expertise with operational staff, including how to handle warning systems, but also the ability to maintain the system.

Another crucial part in flood management is public awareness about the risks in flood prone areas and disaster preparedness as well as the roles of various stakeholders and function of levees and storage dams. Dumping of waste may adversely affect the functionality of the drainage system and ultimately increase the risk of flooding.

Potential flooding in a city may depend on activities farther up in a river basin or a water catchment area. Thus, the PFS may suggest joint training and efforts to bring stakeholders together from a wider geographical and institutional area to learn more about water resource management, water governance, disaster management, and solid waste management (clogging of drainage). The PFS team should explicitly plan activities for capacity development and training, designed and conducted to address the local situation and needs, during the PFS as well as part of a future capacity development program.
(CDIA 2011 Sector Guidelines for pre-feasability studies on Flood and Disaster Management)

2.1.2 Droughts

Most people think of a drought as a period of unusually dry weather that persists long enough to cause problems such as crop damage and water supply shortages. But because dry conditions develop for different reasons, there is more than one definition of drought.

"Drought is caused by not only lack of precipitation and high temperatures but by overuse and overpopulation," said David Miskus, a drought expert and meteorologist at the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center.

In the 1980s, two researchers uncovered more than 150 published definitions of drought which they published in the journal Water International. In an effort to bring some order to measuring drought, the scientists grouped the definitions into four basic categories: meteorological, hydrological, agricultural and socioeconomic. The first three descriptions track drought as a physical phenomenon. The last category deals with drought as a supply-and-demand problem, through the impacts of water shortfalls.

These definitions usually specify the beginning, end and degree of severity of drought by comparing the precipitation over a certain time period to a historical average. Scientists include both rain and snow in precipitation measurements, because some U.S. regions, such as the mountainous West, rely on winter snow for much of their yearly water.

Here are descriptions of the four main categories of drought:

Meteorological drought is specific to different regions, depending on the amount of yearly precipitation that's average for that area. For example, the southwest portion of the United States averages less than 3 inches (7.6 centimeters) of precipitation per year, while the Northwest gets more than 150 inches (381 cm) per year, according to the U.S. Department of Interior. A decrease in precipitation compared to the historical average for that area would qualify as a meteorological drought.

Agricultural drought accounts for the water needs of crops during different growing stages. For instance, not enough moisture at planting time may hinder germination, leading to low plant populations and a reduction in yield.

Hydrological drought refers to persistently low water volumes in streams, rivers and reservoirs. Human activities, such as drawdown of reservoirs, can worsen hydrological droughts. Hydrological drought is often linked with meteorological droughts.

Socioeconomic drought occurs when the demand for water exceeds the supply. Examples of this kind of drought include too much irrigation or when low river flow forces hydroelectric power plant operators to reduce energy production. (Wolchover, 2018)

Various Causes of Droughts

1. **Lack or insufficient rainfall (or precipitation)**

This is the major cause of droughts in most regions. A long-drawn-out period without rainfall can cause an area to dry out. The quantity of water vapor in the atmosphere pretty much impacts the precipitation of an area. When a region has moist and low-pressure systems, there is huge probability that rain, hail, and snow will occur. The exact opposite would happen when the region has high-pressure systems, and less water vapor

Farmer's plant crops in anticipation of rains, and so when the rains fail, and irrigation systems are not in place, agricultural drought happens.

2. **Changes in climate**

Changes in climate, for instance, global warming can contribute to droughts. Global warming is likely to impact the whole world, especially third world economies. Most governments have tried to play down the fact that the earth's temperature has significantly increased. But scientists have proven, without doubt, that human activities are the main contributors to the increase in greenhouse gasses to the atmosphere. This increase in greenhouse gasses has resulted in warmer temperatures. Warmer temperatures are recipes for dryness and bushfires. These set of conditions mightily contribute to prolonged droughts.

3. **Human activities**

Forests are critical components of the water cycle. They help store water, minimize evaporation, and contribute a great deal of atmospheric moisture in the form of transpiration. This, in essence, implies that deforestation, aimed at uplifting the economic status of a region, will expose vast quantities of water to evaporation. Cutting down trees will also take away the capability of the ground to retain water and allow desertification to occur easily. Deforestation also greatly minimizes watershed potential. Over-farming is another human activity contributing to droughts. Over-farming loosens the soil allowing erosion to take place. Soil erosion compromises the capacity of soil to hold water.

4. **Overexploitation of surface water resources**

Specific areas are endowed with surface water resources like rivers and streams whose sources are watersheds and mountains. These surface water resources could dry out if their main sources are interfered with. Irrigation systems and hydroelectric dams are just some of the aspects that contribute to over-exploitation of surface water resources. They also cut off supply of water to downstream communities**.**

Harmful Effects of Droughts

Economic Effects

Economic effects of droughts usually involve loss of money by governments, enterprises, families or individuals. Below is an outline of the main economic impacts of droughts:

- Farmers will have to contend with spending huge sums of money for irrigation and watering animals.

This involves drilling wells or buying water from far distances.

- Low yields equal loss of substantial income.

Low yields also lead to pay cuts and layoffs to farm workers.

- Businesses and industries that produce farm equipment may close down since farmers have no money to purchase equipment.
- Prolonged shortage of rains means drier conditions. This makes an area susceptible to wildfires. Wildfires can destroy property; devastate farms and burn down forests. Governments spend millions to control or put out wildfires annually. All this affects the economy of the region.
- If water supply plummets, hydropower plants operate below capacity, and this means businesses have to pay more for electricity or incur the cost of using their own generators. Energy firms also

lose out since they are unable to satisfy energy demands of the region. The government also loses a big chunk of tax revenue.

Environmental Effects

- Droughts lead to decimation of habitats. Water bodies such as rivers, lakes, ponds, lagoons, and creeks dry out, and this leads to death of water animals.
- Soil moisture is critical to the breakdown of organic matter. Droughts compromise soil quality since there is less to zero organic activity because organisms have died.
- Droughts magnify the impacts of desertification by wiping out any chance of land recovering.
- The quality and health of surface water bodies such as rivers, streams, lakes, and ponds are enormously impacted. This endangers living organisms depending on the water for survival.
- Wildlife walk long distances in search of water. They end up in new dangerous habitats that can lead to their demise.

Social Effects

The social effects of drought are the most potent since they directly impact humans. Many in the third world countries that have experienced drought can attest to their severity.

- Water maintains our health. Sanitation and clean drinking water are critical to a healthy body. Droughts lead to malnutrition, anemia, and hunger.
- Droughts trigger migrations. This means the area will lack young and working population, a critical ingredient to the development of any region.
- Lack of control over when the drought ends can have far-reaching psychological effects like stress, anxiety, and depression. Social interaction reduces and community networks get broken.

(Earth Eclipse)

2.1.3 Cyclones

A weather system consisting of an area of low pressure, in which winds circulate at speeds exceeding 61 km/hr, also known as 'Cyclone' or Tropical Storm. These are non-frontal synoptic scale weather systems originating over tropical waters with organized convention and definite cyclonic surface wind circulation. Winds rotate around the low pressure centre in an anti-clockwise direction in the Northern Hemisphere and in a clockwise direction in the Southern Hemisphere.

2.1.4 Tsunami

Tsunamis are giant waves caused by earthquakes or volcanic eruptions under the sea. Out in the depths of the ocean, tsunami waves do not dramatically increase in height. But as the waves travel inland, they build up to higher and higher heights as the depth of the ocean decreases. The speed of tsunami waves depends on ocean depth rather than the distance from the source of the wave. Tsunami waves may travel as fast as jet planes over deep waters, only slowing down when reaching shallow waters. While tsunamis are often referred to as tidal waves, this name is discouraged by oceanographers because tides have little to do with these giant waves**.**

- Tsunami is a Japanese word which means 'harbour wave'
- Earthquakes under the sea are the main causes of Tsunamis
- The biggest tsunami ever was at Lituya Bay, Alaska on July 9, 1958
- Earliest tsunamis was in Sicily 8,000 years ago
- Landslides and volcanoes can also cause tsunamis

Causes

- Tsunamis are caused by sudden movements of the earth that happens under the sea. Often the most destructive Tsunamis are caused by **earthquakes** but causes can also include volcanic eruptions, landslides or even a comet hitting the sea.
- **Landslides** cause tsunamis when the debris falls into the water. This has the same effect of dropping a large stone into a pool - big ripples are created. But when this happens in the sea and it is thousands of tonnes of rock and earth falling into the sea a very large ripple, more like a tidal wave is created. This travels across the sea until it comes into contact with land and a tsunami is formed.
- **Volcanoes** cause tsunamis when there is an eruption. The volcano can either be on land or under the sea, in which case it is known as a submarine volcano. If the volcanic eruption happens on land, the tsunami is caused by debris and lava from the volcano flowing into the sea, which once again causes a bug ripple.
- If the eruption happens under water, the enormous power of the eruption sends shudders through the earth and disrupts the water. The water in the sea then breaks into waves which travel across the ocean until they come into contact with a coast. Here, a tsunami is formed.

Tsunami is a Japanese word meaning 'harbour wave' that refers to a series of large ocean waves that hit a shoreline. The word originates from Japan because this is the country where tsunamis are most common.

- These tsunami waves may be as long as 100 km and travel across the ocean at speeds of up to 800 kmh. There may be a constant

stream of waves that that batter the shore for between 10 and 60 minutes.

- Tsunamis are also known as tidal waves, due to their large and powerful nature. They have been depicted throughout history, art, television and film as something terrifying, cataclysmic and almost Armageddon-like.

How Do Undersea Earthquakes Start?

The most common cause of a tsunami is for earthquakes. This is what caused the Boxing Day tsunami in the Indian Ocean in 2004 and it is also the reason behind the 2011 Japan tsunami.

To understand how earthquakes cause tsunamis we must first fully understand what causes earthquakes. Remember, tsunamis are an after-effect of an earthquake.

The earth sits on about a dozen tectonic plates. These are large floating pieces of hard rock that are constantly moving and fit together around the world like a jigsaw.

Undersea earthquakes happen when one of these plates is rubbing against another at a plate boundary. The two plates may become stuck as the heavier plate tries to slide under the lighter other. This causes a build up of pressure in a process knows as subduction.

As the heavier plate continues to slide beneath the lighter plate, it causes the lighter plate to bend downwards with the pressure. A point comes when the lighter plate can no longer take the intense pressure and suddenly snaps back up to the surface where it had been before.

The incredible force of the earth's plate shooting upwards in the water causes a huge rise in sea level. A vast body of water moves upward - like a huge mountain of water in the sea.

How Does the Tsunami Develop?

Everybody knows that what goes up must come down. This is particularly true for water which always likes to form a nice flat surface. So once the mountain of water has risen up the next step is for the sea to level itself out.

The mountain of water comes back down. This pushes the water that was underneath it outwards. The force of the water moves through the ocean causing an underwater force that travels for hundreds of Kilometres. The force of the water can reach speeds of up to 800kmh as it surges through the ocean. The energy is underwater and is not noticeable on the surface.

As this force travels through the ocean it may eventually reach the shore. At this point, the sea becomes shallower. However, the energy in the water is still the same. The energy is compressed and the water is pushed upwards. This is how the energy is transferred from being underater into waves on the surface.

Can Anything Be Done?

Unfortunately nothing can be done to prevent Tsunamis. However, there are several organisations that use complex technology to monitor movement of the earths plates and sudden changes in water movement. There are also warning and evacuation procedures in place around countries like Japan and Hawaii where Tsunamis are frequent.

Any sudden earthquake that happens underwater will be detected in the same manner of on on-shore earthquake. These are measured in the Richter scale. If this is recorded then warning systems can sometimes be activated to evacuate people.

Major Tsunamis

- Japan - March 11, 2011
- Indian Ocean - 26 December 2004
- Papua New Guinea - 17 July 1998
- Sea of Japan - 26 May 1983
- Alaska Britis Columbia - 27 March 1964
- Chili - 22 May 1960
- Aleutian Islands - 1 April 1946

(Rickrideshorses, 2018)

2.1.5 Tornadoes

Tornadoes are vertical funnels of rapidly spinning air. Their winds may top 250 miles an hour and can clear a pathway a mile wide and 50 miles long.

Also known as twisters, tornadoes are born in thunderstorms and are often accompanied by hail. Giant, persistent thunderstorms called supercells spawn the most destructive tornadoes.

These violent storms occur around the world, but the United States is a major hotspot with about a thousand tornadoes every year.

"Tornado Alley," a region that includes the area in the eastern state of South Dakota, Nebraska, Kansas, Oklahoma, northern Texas, and eastern Colorado, is often home to the most powerful and destructive of these storms. U.S. tornadoes cause 80 deaths and more than 1,500 injuries per year.

What is a tornado?

A tornado is a violently rotating column of air that extends from a thunderstorm to the ground. It's often portended by a dark, greenish sky. Black storm clouds gather. Baseball-sizehail may fall. A funnel suddenly appears, as though descending from a cloud. The funnel hits the ground

and roars forward with a sound like that of a freight train approaching. The tornado tears up everything in its path.

Characteristics of tornadoes

Twisters are usually accompanied or preceded by severe thunderstorms and high winds. Hail is also common.

Once a tornado hits the ground, it may live for as little as a few seconds or as long as three hours.

The average twister is about 660 feet wide and moves about 30 miles an hour. Most don't travel more than six miles before dying out.

Massive tornadoes, however—the ones capable of widespread destruction and many deaths—can roar along as fast as 300 miles an hour.

These measurements are scientists' best estimations. Anemometers, which measure wind speed, cannot withstand the enormous force of tornadoes to record them.

Tornado destruction

Every year in the United States, tornadoes do about 400 million dollars in damage and kill about 70 people on average.

Extremely high winds tear homes and businesses apart. Winds can also destroy bridges, flip trains, send cars and trucks flying, tear the bark off trees, and suck all the water from a riverbed.

High winds sometimes kill or injure people by rolling them along the ground or dropping them from dangerous heights. But most tornado victims are struck by flying debris—roofing shingles, broken glass, doors, metal rods.

The number of average deaths per year in the United States used to be higher before improved forecasting and warning systems were put into place.

How tornadoes are forecasted

Meteorologists at the U.S. National Weather Service use Doppler radar, satellites, weather balloons, and computer modeling to watch the skies for severe storms and tornadic activity.

Doppler radars record wind speeds and identify areas of rotation within thunderstorms. Since Doppler radar has been in use, the warning time for tornadoes has grown from fewer than five minutes in the 1980s to an average of 13 minutes by the late 2000s.

When weather conditions are conducive for tornado formation, the National Weather Service issues a tornado watch. When a tornado has been sighted or indicated on radar, a tornado warning is issued.

Some scientists, meteorology buffs, and adrenaline junkies hit the road during tornado season to chase storms. Researchers race to place sensors in tornadoes' paths. The sensors measure data such as wind speed, barometric pressure, humidity, and temperature.

The challenge for researchers is being in the right place at the right time. Every morning they study weather conditions and head for the area that seems most likely to spawn a twister. They drive through severe storms, dodge lightning, face flash floods, and get pounded by hail—sometimes for years—before ever spotting a tornado.

2.1.4 Hurricane

Hurricanes are among nature's most powerful and destructive phenomena. On average, 12 tropical storms, 6 of which become hurricanes form over the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico during the hurricane season which runs from June 1 to November 30 each year. In the Central Pacific Ocean, an average of 3 tropical storms, 2 of which become hurricanes form or move over the area during the hurricane season, which runs from June 1 to November 30 each year. Guam, the Northern Marianas and Micronesia experience typhoons all year round but the main season in July through November with a peak from mid-August to mid-September. Over a typical 2-year period, the U.S. coastline is struck by an average of 3 hurricanes, 1 of which is classified as a major hurricane (winds of 111 mph or greater). By knowing what actions to take before the hurricane season begin, when a hurricane approaches, and when the storm is in your area, as well as what to do after a hurricane leaves your area, you can increase your chance of survival. If you, or someone you know, have been a victim of a hurricane, please share your story, including the town and state you were in and the year the event took place.. Please note that NS will then have permission to use your story for educational campaigns. Sharing this information may help save someone’s life in the future. Read stories from survivors and learn how to stay safe.

Hurricane Hazards

While hurricanes pose the greatest threat to life and property, tropical storms and depression also can be devastating. The primary hazards from tropical cyclones (which include tropical depressions, tropical storms, and hurricanes) are storm surge flooding, inland flooding from heavy rains, destructive winds, tornadoes, and high surf and rip currents.

- Storm surge is the abnormal rise of water generated by a storm's winds. This hazard is historically the leading cause of hurricane related deaths in the United States. Storm surge and large battering waves can result in large loss of life and cause massive destruction along the coast.
- Storm surge can travel several miles inland, especially along bays, rivers, and estuaries.
- Flooding from heavy rains is the second leading cause of fatalities from land falling tropical cyclones. Widespread torrential rains associated with these storms often cause flooding hundreds of

miles inland. This flooding can persist for several days after a storm has dissipated.

- Winds from a hurricane can destroy buildings and manufactured homes. Signs, roofing material, and other items left outside can become flying missiles during hurricanes.
- Tornadoes can accompany land falling tropical cyclones. These tornadoes typically occur in rain bands well away from the center of the storm.
- Dangerous waves produced by a tropical cyclone's strong winds can pose a significant hazard to coastal residents and mariners. These waves can cause deadly rip currents, significant beach erosion, and damage to structures along the coastline, even when the storm is more than a 1,000 miles offshore.

(National Weather Service NOAA)

Hurricane Preparedness - Hazards

A better understanding of tropical cyclones and hurricane hazards will help to make a more informed decision on your risk and what actions to take.

The major hazards associated with hurricanes are:

- storm surge and storm tide
- heavy rainfall and inland flooding
- high winds
- rip currents
- tornadoes

Storm Surge & Storm Tide

Storm surge and large waves produced by hurricanes pose the greatest threat to life and property along the coast.

Storm Surge is an abnormal rise of water generated by a storm's winds. Storm surge can reach heights well over 20 feet and can span hundreds of miles of coastline.

Storm Tide is the water level rise during a storm due to the combination of storm surge and the astronomical tide.

The destructive power of storm surge and large battering waves can result in loss of life, buildings destroyed, beach and dune erosion and road and bridge damage along the coast. Storm surge can travel several miles inland. In estuaries and bayous, salt water intrusion endangers public health and the environment.

Heavy Rainfall & Inland Flooding

Tropical cyclones often produce widespread, torrential rains in excess of 6 inches, which may result in deadly and destructive floods. In fact, flooding is the major threat from tropical cyclones for people living inland. Flash flooding, defined as a rapid rise in water levels, can occur quickly due to

intense rainfall. Longer term flooding on rivers and streams can persist for several days after the storm. When approaching water on a roadway, always remember Turn Around Don't Drown.

Rainfall amounts are not directly related to the strength of tropical cyclones but rather to the speed and size of the storm, as well as the geography of the area. Slower moving and larger storms produce more rainfall. In addition, mountainous terrain enhances rainfall from a tropical cyclone.

High Winds

Tropical storm-force winds are strong enough to be dangerous to those caught in them. For this reason, emergency managers plan on having their evacuations complete and their personnel sheltered *before* the onset of tropical storm-force winds, not hurricane-force winds.

Hurricane-force winds, 74 mph or more, can destroy buildings and mobile homes. Debris, such as signs, roofing material, siding and small items left outside become flying missiles during hurricanes. Winds can stay above hurricane strength well inland. In 2004, Hurricane Charley made landfall at Punta Gorda on the southwest Florida coast and produced major damage well inland across central Florida with gusts of more than 100 mph.

Atlantic and Eastern Pacific hurricanes are classified into five categories according to the **Saffir-Simpson Hurricane Wind Scale**, which estimates potential property damage according to the hurricane's *sustained* wind speed.

Rip Currents

The strong winds of a tropical cyclone can cause dangerous waves that pose a significant hazard to mariners and coastal residents and visitors. When the waves break along the coast, they can produce deadly rip currents - even at large distances from the storm.

Rip currents are channeled currents of water flowing away from shore, usually extending past the line of breaking waves, that can pull even the strongest swimmers away from shore.

In 2008, despite the fact that Hurricane Bertha was more than a 1,000 miles offshore, the storm resulted in rip currents that killed three people along the New Jersey coast and required 1,500 lifeguard rescues in Ocean City, Maryland, over a 1 week period.

In 2009, all six deaths in the United States directly attributable to tropical cyclones occurred as the result of drowning from large waves or strong rip currents.

Tornadoes

Hurricanes and tropical storms can also produce tornadoes. These tornadoes most often occur in thunderstorms embedded in rain bands well away from the center of the hurricane; however, they can also occur near

the eyewall. Usually, tornadoes produced by tropical cyclones are relatively weak and short-lived, but they still pose a significant threat.

Plan for a Hurricane

The best time to prepare for a hurricane is before hurricane season begins on June 1. It is vital to understand your home's vulnerability to storm surge, flooding, and wind. Here is your checklist of things to do BEFORE hurricane seasons begins.

- Know your zone: Do you live near the Gulf or Atlantic Coasts? Find out if you live in a hurricane evacuation area by contacting your local government/emergency management office or by checking the evacuation site website.
- Put Together an Emergency Kit: Put together a basic emergency. Check emergency equipment, such as flashlights, generators and storm shutters.
- Write or review your Family Emergency Plan: Before an emergency happens, sit down with your family or close friends and decide how you will get in contact with each other, where you will go, and what you will do in an emergency. Keep a copy of this plan in your emergency supplies kit or another safe place where you can access it in the event of a disaster. Start at the Ready. Gov emergency plan webpage.
- Review Your Insurance Policies: Review your insurance policies to ensure that you have adequate coverage for your home and personal property.
- Understand NWS forecast products, especially the meaning of NWS watches and warning.
- Preparation tips for your home from the Federal Alliance for Safe Homes
- Preparation Tips for those with Chronic Illnesses

Take Action

When a hurricane threatens your community, be prepared to evacuate if you live in a storm surge risk area. Allow enough time to pack and inform friends and family if you need to leave your home.

- Secure your home: Cover all of your home's windows. Permanent storm shutters offer the best protection for windows. A second option is to board up windows with 5/8 inch exterior grade or marine plywood, built to fit, and ready to install. Buy supplies before the hurricane season rather than waiting for the pre-storm rush.
- Stayed tuned in: Check the websites of your local National Weather Service office and local government/emergency management office. Find out what type of emergencies could occur and how you should respond. Listen to NOAA Weather Radio or other radio or TV stations for the latest storm news.
- Follow instructions issued by local officials. Leave immediately if ordered!
- If NOT ordered to evacuate:

- Take refuge in a small interior room, closet, or hallway on the lowest level during the storm. Put as many walls between you and the outside as you can.
- Stay away from windows, skylights, and glass doors.
- If the eye of the storm passes over your area, there will be a short period of calm, but at the other side of the eye, the wind speed rapidly increases to hurricane force winds coming from the opposite direction.

After Hurricane

- Continue listening to a NOAA Weather Radio or the local news for the latest updates.
- If you evacuated, return home only when officials say it is safe.
- Once home, drive only if necessary and avoid flooded roads and washed-out bridges. If you must go out, watch for fallen objects in the road, downed electrical wires, and weakened walls, bridges, roads, and sidewalks that might collapse.
- Walk carefully around the outside of your home to check for loose power lines, gas leaks, and structural damage.
- Stay out of any building if you smell gas, if floodwaters remain around the building, Â if the building or home was damaged by fire, or if the authorities have not declared it safe.
- Carbon monoxide poisoning is one of the leading causes of death after storms in areas dealing with power outages. Never use a portable generator inside your home or garage. Review generator safety.
- Use battery-powered flashlights. Do NOT use candles. Turn on your flashlight before entering a vacated building. The battery could produce a spark that could ignite leaking gas, if present.(National Weather Service NOAA)

2.1.6 Hailstorms

A hailstorm is an unusual weather phenomenon in which balls of ice, called hail, fall from the sky. The ice balls are nothing more than solid precipitation that will form under certain conditions.

Fast Facts about Hail

- Hail is formed at high altitudes within massive clouds when super cooled water droplets adhere to each other and form layers of ice.
- The average velocity of a falling hailstone is approximately 106 miles per hour (mph).

What causes a hailstorm to occur?

Several conditions are required in the atmosphere in order for hailstorms to occur. Highly developed Cumulonimbus clouds need to be present. These are the massive anvil or mushroom shaped clouds that are seen

during thunderstorms which can reach heights up to 65,000 feet. There must also be strong currents of air ascending through these clouds. These currents are commonly known as updrafts. The updrafts contain ice particles, as a large number of water droplets become solid ice at the low temperatures found at high altitudes within the massive clouds. The last remaining condition is that the clouds will need to contain high concentrations of super cooled liquid water.

How does hail forms?

A hailstone begins as a water droplet that is swept up by an updraft inside of a thundercloud. Inside the cloud, there are a large number of other super cooled water droplets already present. These super cooled particles will adhere to the water droplet’s surface, forming layers of ice around it. As the water droplet reaches higher elevations within the cloud it comes into contact with more and more super cooled particles. This is because it is at the highest parts of the cloud, where the temperature is too low (at least 32 degrees Fahrenheit) for water molecules to remain in either a liquid or gaseous state. The hail embryo will grow larger and larger as it reaches higher altitudes in the updraft.

The hailstone will reach a size and weight where gravity will begin to act on it and pull it down. However, this is not necessarily the end of its formation, as it could be pulled into another strong updraft and remains in the upper part of the cloud. A stone the size of a golf ball would need an updraft flowing at 60 miles per hour (mph) to keep it elevated in the cloud. The size the hailstone reaches depends on the amount of time it spends surrounded by super cooled water droplets, but eventually gravity causes the stone to fall to the Earth.

During this process hailstones can become considerably large. In 2010, the largest hailstone found in the United States (Vivian, South Dakota) was 8 inches in diameter, 18.5 inches in circumference, and weighed approximately two pounds. As gravity takes over, they will fall to Earth at approximately 106 miles per hour. The exact velocity each stone falls at will vary depending on several conditions, such as weight, air friction and collisions with other suspended objects.

What is hail?

Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people.

How does hail form?

Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone's surface. If the water freezes instantaneously when colliding with the hailstone, cloudy ice will form as air bubbles will be trapped in the newly formed ice. However, if the water freezes slowly, the air bubbles can escape and the new ice will be clear. The hail falls when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens.

Hailstones can have layers of clear and cloudy ice if the hailstone encounters different temperature and liquid water content conditions in the thunderstorm. The conditions experienced by the hailstone can change as it passes horizontally across or near an updraft. The layers, however, do not occur simply due to the hailstone going through up and down cycles inside a thunderstorm. The winds inside a thunderstorm aren't simply up and down; horizontal winds exist from either a rotating updraft, like in super cell thunderstorms, or from the surrounding environment's horizontal winds. Hailstones also do not grow from being lofted to the top of the thunderstorm. At very high altitudes, the air is cold enough (below -40°F) that all liquid water will have frozen into ice, and hailstones need liquid water to grow to an appreciable size.

How does hail fall to the ground?

Hail falls when it becomes heavy enough to overcome the strength of the thunderstorm updraft and is pulled toward the earth by gravity. Smaller hailstones can be blown away from the updraft by horizontal winds, so larger hail typically falls closer to the updraft than smaller hail. If the winds near the surface are strong enough, hail can fall at an angle or even nearly sideways! Wind-driven hail can tear up siding on houses, break windows and blow into houses, break side windows on cars, and cause severe injury and/or death to people and animals.

How fast does hail fall?

This is a very complicated answer. The fall speed of hail primarily depends on the size of the hailstone, the friction between the hailstone and surrounding air, the local wind conditions (both horizontal and vertical), and the degree of melting of the hailstone. Early research assumed that hailstones fell like solid ice spheres and showed very high fall speeds, even for very small hailstones. However, recent research outside of NSSL using 3-D printed casts of real hailstones suspended in a vertical wind tunnel has repeatedly shown that natural hailstones fall more slowly than solid ice spheres. For small hailstones (<1-inch in diameter), the expected fall speed is between 9 and 25 mph. For hailstones that one would typically see in a severe thunderstorm (1-inch to 1.75-inch in diameter), the expected fall

speed is between 25 and 40 mph. In the strongest super cells that produce some of the largest hail one might expect to see (2-inches to 4-inches in diameter), the expected fall speed is between 44 and 72 mph. However, there is much uncertainty in these estimates due to variability in the hailstone's shape, degree of melting, fall orientation, and the environmental conditions. However, it is possible for very large hailstones (diameters exceeding 4-inches) to fall at over 100 mph.

What areas have the most hail?

Although Florida has the most thunderstorms, Nebraska, Colorado, and Wyoming usually have the most hailstorms. The area where these three states meet – "hail alley" – averages seven to nine hail days per year. Other parts of the world that have damaging hailstorms include China, Russia, India and northern Italy.

When viewed from the air, it is evident that hail falls in paths known as hail swaths. These occur as storms move while the hail is falling out They can range in size from a few acres to an area 10 miles wide and 100 miles long. Some storms, instead of producing large hail, instead produce copious amounts of small hail. Storms like these have produced hail drifts that, when captured in clogged drainage channels, formed piles of hail several feet deep. Hail that completely covers roadways is especially hazardous because if deep enough, a vehicle's tires may not touch the roadway at all, with the vehicle instead driving on the hail, which acts exactly like an icy roadway in the winter.

How large can hail get?

The largest hailstone recovered in the United States fell in Vivian, South Dakota, on June 23, 2010, with a diameter of 8 inches and a circumference of 18.62 inches. It weighed 1 lb 15 oz.

How does hail compare to other types of frozen precipitation?

The primary difference between frozen precipitation is how the different types grow and the maximum sizes of the individual particles.

Snow forms mainly when water vapor turns to ice without going through the liquid stage. This process is called deposition. Snow can form in the gentle updrafts of stratus clouds or at high altitudes in very cold regions of a thunderstorm. Snowflakes that most of us are used to seeing are not individual snow crystals, but are actually aggregates, or collections, of snow crystals that stick or otherwise attach to each other. Aggregates can grow to very large sizes compared to individual snow crystals.

Graupel are soft, small pellets formed when supercooled water droplets (at a temperature below 32°F) freeze onto a snow crystal, a process called riming. If the riming is particularly intense, the rimed snow crystal can grow to an appreciable size, but remain less than 0.2 inches. Graupel is

also called snow pellets or soft hail, as the graupel particles are particularly fragile and generally disintegrate when handled.

Sleet are small ice particles that form from the freezing of liquid water drops, such as raindrops. At ground level, sleet is only common during winter storms when snow melts as it falls and the resulting water refreezes into sleet prior to hitting the ground. In thunderstorms, sleet is possible above the melting level where cloud droplets become super cooled and may instantaneously freeze when making contact with other cloud particles or debris, such as dust particles. Sleet is also called ice pellets.

Hail is frozen precipitation that can grow to very large sizes through the collection of water that freezes onto the hailstone's surface. Hailstones begin as embryos, which include graupel or sleet, and then grow in size. Hailstones can have a variety of shapes and include lumps and bumps that may even take the shape of small spikes. Hailstones must be at least 0.2 inches in size.

Hail Detection

Hail can be detected using radar. On Doppler radar, hail generally sends a return signal that looks like extremely heavy rainfall.

Dual-polarization radar technology, used by the NWS, can help tell the difference between hail, ice pellets and rain, and even determine hail size.

Hail Forecasting

When forecasting hail, forecasters look for deep moist convection, in addition to these three basic ingredients:

- Adequate updraft to keep the hailstone aloft for an appropriate amount of time,
- Sufficient super cooled water near the hailstone to enable growth as it travels through an updraft, and
- A piece of ice, snow or dust for it to grow upon.

There is no clear distinction between storms that do and do not produce hailstones. Nearly all severe thunderstorms probably produce hail aloft, though it may melt before reaching the ground.

Multi-cell thunderstorms produce many hailstones, but they are not usually very large. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for hailstones to grow.

In contrast, supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud where they can accumulate more

layers of ice. In general, hail 2 inches (5 cm) or larger in diameter is associated with supercells.

In all cases, the hail falls when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft, the larger the hailstone can grow.

(NATIONAL SEVERE STORMS LABORATORY)

2.1.7 Cloud Burst

WHAT IS A CLOUDBURST? A cloudburst is a sudden rainfall which can be quite unexpected, very abrupt, accompanied by hail and thunder. WHAT HAPPENS? It usually occurs in high altitude areas due to the formation of a low pressure area on the top of a mountain. The low pressure zone attracts clouds to the top of the mountain with great force. When they hit the peak, the moisture content is released in the form of rain. In some cloudbursts, up to 5 inches (almost 13 centimeters) of rain can fall in an hour, often in the form of extremely large droplets. All heavy rains are not necessarily cloudbursts. Because of the amount of rain involved, a cloudburst can be quite dangerous, especially if it lasts for several hours. Flooding is common with cloudbursts, sweeping away people, animals and land on its way. Often, these severe rainstorms appear in the summer, and in farming communities, they are sometimes welcomed, as a cloudburst can irrigate crops very thoroughly. WHAT IS A FLASH FLOOD? A flash flood is sudden flooding that occurs when floodwaters rise rapidly with no warning within several hours of an intense rain. They often occur after heavy rainfall, usually from a storm. WHA T HAPPENS? A flood results from days of heavy rain and / or melting snows, when rivers rise and go over their banks whereas flash flood is caused by excess water, usually from a storm. This usually happens downstream from the storm as heavy rains produce more water than the area can handle with nothing to block its buildup or soak it into the ground.

Flash floods can be caused by:

- A Heavy Rain In An Area With High Runoff (No Absorption)
- A Prolonged Heavy Rain Feeding Into Area Watercourses
- A Sudden Snow Melt
- A Rain On Frozen Soil Which Melts The Snow In Addition To The Rain Volume Which Cannot Be Absorbed Into Frozen Ground
- A Breakage In A Dam Or Containment System
- High Tides
- Storm Surges
- Tsunamis
- Downstream Blockage Of The River Channel

These All Lead to the Same Effects

- Destruction Of Roads And Bridges

- Faster Erosion Of River Banks
- Disruption Of Water Supplies And Waste Treatment
- Danger To The Life And Property

2.1.8 Snow Avalanches

What is an avalanche?

Avalanche is large amount of snow sliding down a mountainside. It can be compared to a landslide, only with snow instead of earth. It is also called a snow-slide and happens on mountains with extreme amounts of snow fall and build-up. Wherever snow is lying on ground on an extreme and sufficient angle there is potential for a sleeping avalanche. WHAT HAPPENS? The snow packed down on the surface cannot support itself with all the weight. When another factor is introduced, such as a person's step, this helps to loosen the snow and an avalanche occurs. Major temperature changes, rapid wind speed and man-made influences are the main causers of why avalanches occur. Three main factors effect whether or not avalanches are probable to occur. These three factors are the weather, the snow pack and the terrain.

What is glacial lake outburst flood?

Global climatic change during the first half of the twentieth century has had a significant impact on the high mountainous glacial environment. Many big glaciers melted rapidly forming a large number of glacial lakes. Due to an increase in the rate at which ice and snow has melted; the accumulation of water in these lakes has been increasing rapidly. Sudden discharge of large volumes of water with debris from these lakes causes glacial lake outburst floods (GLOFs) in valleys downstream. Also, glacial lake outburst may be triggered by earthquake, landslide, avalanche, rock-fall, etc. Such outbursts can lead to discharge of millions of cubic metres of water and debris in a few hours and can cause catastrophic devastation and flooding up to hundreds of kilometers downstream. The sudden flooding can lead to serious damage to life, property, agriculture, livestock, forests, ecosystems, the livelihoods of mountain communities heavily dependent on mountain ecosystems for sustenance, as well as precious socio-economic infrastructure/assets like hydro-power, electricity, communications, roads and bridges. All of these can induce forced migration and undermine the sources of livelihood of mountain people and downstream communities.

(SSDMA.NIC)

An avalanche is a rapid flow of snow down a hill or mountainside. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others. Wintertime, particularly from December to April, is when most avalanches tend to happen. However, avalanche fatalities have been recorded for every month of the year.

Anatomy of an avalanche

All that is necessary for an avalanche is a mass of snow and a slope for it to slide down. For example, have you ever noticed the layer of snow on a car windshield after a snowfall? While the temperature remains low, the snow sticks to the surface and does not slide off. After the temperature increases, however, the snow will sluff, or slide, down the front of the windshield, often in small slabs. This is an avalanche on a miniature scale.

Of course, mountain avalanches are much larger and the conditions that cause them are more complex. A large avalanche in North America might release 230,000 cubic meters (300,000 cubic yards) of snow. That is the equivalent of 20 football fields filled 3 meters (10 feet) deep with snow. However, such large avalanches are often naturally released, when the snowpack becomes unstable and layers of snow begin to fail. Skiers and recreationalists usually trigger smaller, but often more deadly avalanches.

An avalanche has three main parts. The starting zone is the most volatile area of a slope, where unstable snow can fracture from the surrounding snow cover and begin to slide. Typical starting zones are higher up on slopes. However, given the right conditions, snow can fracture at any point on the slope.

The three parts of an avalanche path are the

- starting zone,
- avalanche track, and
- run out zone.

— Credit: Betsy Armstrong

The avalanche track is the path or channel that an avalanche follows as it goes downhill. Large vertical swaths of trees missing from a slope or chute-like clearings are often signs that large avalanches run frequently there, creating their own tracks. There may also be a large pile-up of snow and debris at the bottom of the slope, indicating that avalanches have run.

The run out zone is where the snow and debris finally come to a stop. Similarly, this is also the location of the deposition zone, where the snow and debris pile the highest.

Several factors may affect the likelihood of an avalanche, including weather, temperature, slope steepness, slope orientation (whether the slope is facing north or south), wind direction, terrain, vegetation, and general snowpack conditions. Different combinations of these factors can create low, moderate, or extreme avalanche conditions. Some of these conditions, such as temperature and snowpack, can change on a daily or hourly basis.

(National Snow & Ice Data Center)

2.1.9 Heat and Cold Waves

Temperature conditions, which vary from extreme hot to chilly weather differ from place to place. In fact, people living at a place for long get acclimatized to the normal weather climate of that place/region. For instance, in the cold climate region (extra tropical regions or high level stations), day temperature of more than 30° C may be a hot day for the locals whereas this temperature in the warm climate region may present the feeling of comfortable weather. In the equatorial and tropical regions, locals are accustomed to wand hot weather. Threshold temperature at which hot weather begins to cause discomfort and health problems for people in these regions is apparently much higher than in the higher latitudes.

Comfortable temperature range for inland and coastal stations of the same climate regimes may also differ substantially due to varying humidity levels and the wind flow. In these cases, it is the variation of effective temperature (which takes into account wind speed and humidity along with ambient air temperature) from the normal climatic conditions, instead of the ambient air temperature alone, which influences the comfort level and related health risks.

Similarly, people in cold climatic conditions are acclimatized to rather low temperatures and threshold values for cold wave cohesions in those regions are much lower than for people living in warm climates. Thus, health related problems due to cold waves in the extra-tropical countries are different, compared to those in the tropics. Injuries due to extreme cold temperatures and related problems are more common in the extratropics.

Threshold values of prevailing air temperature and their departure froin normal for heat and cold waves, therefore, differ from one place to another and are primarily dependent on the following factors:

- Local climatic conditions
- Geographic and Topographic features of the place

It should also be noted that heat wave is reckoned with reference to abnormal rise in the day temperature (the so called Maximum Temperature) whereas cold wave is reckoned with reference to an abnormal fall in the early morning temperature i.e. the Minimum Temperature.

Criteria in Extratropical Countries

Heat Wave

In the extra tropical countries, heat wave is considered as the period of abnormally hot and dry. Weather or when it is uncomfortably hot due to humidity. To be tenned heat wave, it should last atleast more than a day over the area. However; conventionally heat wave lasts for several days to several weeks depending on the prevailing weather conditions.

Cold Wave

Weather fluctuations in the extra-tropical regions are rather rapid and related with fast movement of weather systems. Many a times, cold air Inass sweeps in rapidly in the rear of a weather disturbance, which causes the chill to be more effective. Criterion for cold wave includes not only the minimum temperature to which it may fall but also the rate of temperature fa11 within 24 hours.

Criteria followed in India

India Meteorological Department uses a simple procedure to define heat and cold waves in relation with temperature departures from the normal day (Maximum) and night (Minimum) temperatures of the place or area. Heat waves are termed as moderate or severe if the prevailing maximum temperatures are markedly C6-7O C) or 8O C or more above normal, respectively. In the same way, cold waves are tenned mode .ate or severe if the prevailing minimum temperatures are markedly 9 (6-7°C) below normal or fall by 8OC or more below normal. This is now being revised to make terminologies more in conformity with international practices by linking the temperature departures with local climatic conditions and comfort levels instead of basing them on temperature departure values alone. Concept of Hot Day and Cold Day has been also added to describe the temperature extremes which are rather border line cases prior to attaining heat and cold wave stage.

Causes of Heat Wave

Progressive northward southward march of the sun towards the tropic of cancer/capricorn (23030' NIS latitude) brings summer season to the northern southern hemisphere, respectively. As the associated solar heating progresses with it, land areas in the interior of the continents consistently experience high temperatures during the summer season. Under favourable weather situations, which inhibit cloud formation and facilitate inflow of warmer air, day temperatures may rise substantially above normal values and may lead to heat wave conditions over the area/region.

Weather features, found favourable, for heat waves in the extratropical regions are:

I. Inflow of wann tropical air to higher latitudes. It is caused by the south-westerly winds in the northern hemisphere, at sea level and aloft. In the southern hemisphere, advection of warm tropical air to higher latitudes takes place with northwesterly wind flow.
II. Little or no moisture in the upper atmosphere makes the sky cloud free and allows maximum solar heating.

In the tropical regions, hot and dry spells generally prevail over land locked regions of the tropics during the summer months. In the absence of any low pressure system, persistent heating due to intense sunshine under cloud free sky may lead to favourable conditions for day temperatures to rise above normal, resulting in moderate to severe heat wave conditions.

Heat wave over India

Climatologically, there is consistently high temperature during the months of April-June with May recording the highest value. Over some areas of central and northwest India, the peak is reached in June before the onset of the southwest monsoon. Occasionally, abnormally above normal day temperatures are reported in the months of March and July as well from some pasts of the country.

Apart from solar heating, dry continental westerly wind prevails over northern and central parts of the country, which gives clear weather north of the 20"N latitude. Long trajectory of the wind flow over hot land areas provides favourable conditions for prolonged hot spells. This is occasionally disturbed by the low pressure systems moving west to east across north India, as a trough or closed cyclonic circulation which may give rise to convective activity, cloudiness and precipitation and bring temporary break in the prevailing hot weather

The favourable factors for heat wave are:

- Hot dry air, with history of long-land travel, prevailing over the region.
- Absence of weather generating low pressure systems moving across northwest India.

Causes of Cold Wave

Cold wave conditions occur during the winter months when the cold air Inass from higher latitudes sweeps over the region. In the rear of well marked moving low/pressure system in the westerly wind flow of rnilatitudes, which travel from west to east, winds from northwesterly/southwesterly direction in northern/southern hemisphere prevail and bring cold air mass from higher latitudes. Cold wave conditions develop if the temperature falls rapidly much below normal. Occasionally,

foggy weather develops during the day which inhibits day warming and provides favourable conditions for cold wave conditions to linger on. Clear sky conditions during the night, further facilitate lowering of temperatures by unobstmcted radiation cooling.

The conditions favourable for cold wave are:

(i) Inflow of cold air mass from higher latitudes over the region in the rear of the passage of well marked low pressure system in the westerly wind flow of mid-latitudes.
(ii) Foggy weather during the day which inhibits day warming of the region.
(iii) Strong radiation cooling during the night under clear sky conditions.

Cold wave over India

Cold waves over the country are generally experienced during December - February. Rarely these may also occur in the northern parts of the country in the months of November and March as well. The frequency of occurrence of cold waves is maximum over northwestern parts of India. It falls considerably towards the southern and eastern parts.

Occurrence of cold wave is associated with the inflow of very cold air from extreme northwestern parts of the Indian-sub-continent or even beyond. The following weather situations are favourable:

(i) Passage of a well-marked low pressure system in the upper air westerlies and or a low pressure system at sea-level and aloft across north India and/or adjoining regions. The system generally causes widespread rainfall activity over the plains and snowfall over the hills.
(ii) In the rear of the rainfall/snowfall activity, northwesterly winds may set over the region and cause inflow of cold air mass from higher latitudes andlor mountain regions.
(iii)Occasionally, in the absence of western disturbances and persistent clear sky conditions, intense nocturnal radiation cooling may also cause night temperatures falling below normal and result in cold wave conditions.

Heat Wave and Thermal Stress

During heat wave conditions, environment temperature is much higher than the normal body temperature. Human body finds it difficult to get rid off its excess heat. It calls upon the millions of sweat glands, which perforate the outer layer of the skin. These tiny glands can shed great quantities of water as we perspire. The evaporation of perspiration has the effect of absorbing the heat energy in the form of latent heat of evapordtion, which cools the body and helps in maintaining the normal

body temperature. Excessive perspiration can, however, cause dehydration and salt deficiency in the body. When the air is humid, evaporation process is retarded and the body has to make strenuous efforts to dissipate the extra body heat and this may result in heat related illnesses,'aq mentioned below:

- Heat Rashes (Prickly Heat)
- Heat Cramps
- Heat Syncope
- Heat Exhaustion
- Heat Stroke. It is an emergency situation and needs immediate medical attention.

Apart from human stress, heat wave conditions lead to increased demand of water for public, industry and irrigation.

Cold Wave and Thermal Stress

Similarly, by prolonged exposure to cold wave conditions, abnormally low body temperature may occur as the body loses heat faster than it can produce by muscle contractions, metabolism and shivering. Early symptoms are generally slow and may cause numbness and injuries to exposed parts of the body. Shallow breathing, decreased level of consciousness, clumsy movements, blurred speech and blue - grey skin may follow if exposure persists. If the heat loss continues, it can lead to unconsciousness and death.

Cold wave related illnesses are

- Frostbite, which cause numbness or may temporarily cause blue-white skin colour.
- Chill blains
- Frostbite
- Hypothermia - an emergency condition which needs immediate medical attention.

Prevention

Best way to prevent illnesses due to heat and cold waves is to avoid prolonged exposure to the outdoor environment. The following precautions can, however, help to minirnise ill effects due to exposure:

Heat wave: clothing

- Wear light weight, light colored cotton clothings which can absorb sweat from the skin as the evaporation of sweat decreases the body's temperature.
- Upper body sweats more than the lower half, so wearing clothing of loose fittings which allows for more air circulation from the waist up is a good way to transfer heat away from the body.

- While outdoor in hot sunny weather, cover the head with well ventilated hat or cap. It helps heat loss from the body and also protects it from direct exposure to sunshine.

Avoid Dehydration

- Drink plenty of water and fluids. Drink extra fluid if you sweat a lot and increase salt intake if not on salt restricted diet. Carry a bottle of water while going out and sip water frequently.
- Avoid alcoholic beverages because alcohol can cause dehydration.

Cold waves

Like heat waves, preventive measures are the best way to avoid injuries/illnesses due to exposure during cold waves. Apart from humans, cattle and pets need to be saved from over exposure to cold wave conditions.

Preparedness: Advance Warnings

Weather forecast issued by a number of countries includes day and night temperature forecasts with.specia1 warnings for extreme temperature as and when likely to occur. Planning out-door activities, clothes, and other steps necessary to protect from likely extreme temperature conditions can help minimise the thermal stress and adverse impacts on human health. In many countries Heat

Index and Chill factors have been developed which are included in weather bulletins. These provide necessary guidelines to the locals on the extreme temperature conditions and related precautions.

Weather bulletins for agriculturists include advance warnings for extreme ambient and ground temperatures, which may cause damage to crops. The parameters of the warnings or advisories vary as per the local climatic and geographic features. These, however, enable farmers to protect their crops from the intense cold and frost by initiating preventive measures to minimise the likely damages. Irrigating and making heating arrangements in-the field by burning dried leaves, tree branches and other wastes are generally resorted to.

Prolonged heat wave may lead to severe damage to crops, parched land and other drought like situations and related disasters. With warning for impend ill/g heat waves, action needs to be initiated to conserve water, mulching and tilling of the soil for moisture retention, and irrigating the fields, which may help to minimise the damages to the standing crops. Similar action as per local needs should also be taken to protect livestock and poultry from the effects of extreme heat. Weather bulletins of some of

the countries also cater to the specific industrial needs in respect of extreme temperatures which may affect their production and sales as well.

Heat and Cold waves conditions cause thermal stress to human body, which may lead to severe health problems and even threat to life. These also have severe adverse impacts on agriculture and industrial productions. In many countries, heat and cold waves account for ignore deaths than any other natural disaster. In India, Orissa and Andhra Pradesh appear Ignore vulnerable to heat waves apart from the plains of north India. Cold waves affect the northernmost parts of the country and the hilly areas. Many a times, cold wave conditions also prevail in the plains of north India. As human beings have great capacity to adapt them to the climate in which they live, threshold value of extreme heat or cold wave temperatures, which may cause hazardous weather, are related to normal temperature values of the place and therefore vary from place to place. The frequency and severity of occurrence of heat and cold waves and their severity is dependent on factors like the geographical location and the c1imatic conditions of the area region. Many parts of the world are, however, affected every year with varying degrees of severity. Most vulnerable are those who are in the susceptible age groups like the very young and the old or the infirm with fragile health conditions, chronic invalids and those with weight and alcoholic problems which for apparent reasons have little adaptability to extreme temperature variations. Weaker sections of the society who cannot afford to ensure protection against the extremes of weather are also among the, easy targets of the extreme weather conditions. The best way to prevent illnesses is, however, to avoid prolonged exposure to outdoor environment during heat and cold wave conditions.

2.1.10 Thunder and Lightening

Lightning is the most spectacular element of a thunderstorm. In fact it is how thunderstorms got their name. Wait a minute; what does thunder have to do with lightning? Well, lightning *causes* thunder.

Lightning is a discharge of electricity. A single stroke of lightning can heat the air around it to 30,000°C (54,000°F)! This extreme heating causes the air to expand explosively fast. The expansion creates a shock wave that turns into a booming sound wave, known as thunder.

As ice crystals high within a thunderstorm cloud flow up and down in the turbulent air, they crash into each other. Small negatively charged particles called electrons are knocked off some ice and added to other ice as they crash past each other. This separates the positive (+) and negative (-) charges of the cloud. The top of the cloud becomes positively charged while the base of the cloud becomes negatively charged.

Because opposites attract, the negative charge at the bottom of the storm cloud wants to link up with the ground's positive charge. Once the negative charge at the bottom of the cloud gets large enough, a flow of negative charge called a stepped leader rushes toward the Earth. The positive charges at the ground are attracted to the stepped leader, so positive charge flows upward from the ground. When the stepped leader and the positive charge meet, a strong electric current carries positive charge up into the cloud. This electric current is known as the return stroke. We see it as the bright flash of a lightning bolt.

Thunder and lightning occur at roughly the same time although you see the flash of lightning before you hear the thunder. This is because light travels much faster than sound.

Most thunderstorms form with three stages: the ***cumulus stage*** when storm clouds form, the ***mature stage*** when the storm is fully formed, and then the ***dissipating stage*** when the storm weakens and breaks apart.

The Cumulus Stage

When warm, moist air moves upward in an updraft, puffy cumulus clouds may form in the atmosphere. The moisture in the air condenses into water droplets as it rises. The cloud will continue to grow as long as warm air from below continues to rise.

There are several ways that an updraft of warm moist air can form. Sometimes air is forced up the side of a mountain. Air is also forced upward at weather fronts, where warm and cool air masses collide. But often, updrafts form without a mountain or front to guide them – just because warm air rises. Air near the ground heats up during the day as energy from the Sun heats the ground, which then heats the air. The warmed air rises higher in the atmosphere because warm air has less mass than cool air, making it lighter.

The Mature Stage

As the cumulus cloud continues to grow; the tiny water droplets within it grow larger too as more water from the rising air is added to the droplets. The cloud starts to look dark and grey as more water is added to it. And the growing droplets that make up the cloud become heavy. Raindrops start to fall through the cloud when the rising air can no longer hold them up. Meanwhile, cool dry air flows downward in the cloud, called a downdraft, pulling water downward as rain. With an updraft, downdraft and rain, the cloud is now called a cumulonimbus cloud and the cycling of air up and down is called a thunderstorm cell.

The moving air within the cloud builds up electric charges as it slides past other air. The build up of electric charges allow lightning to form, much in the same way that you can create a spark after shuffling your feet on a carpet. Thunder is the sound that happens when lightning strikes. It often happens after you see the bolt of lightning because sound travels more slowly than light.

The Dissipating Stage

When the downdrafts in the cloud become stronger than the updraft, the storm starts to weaken. Since warm moist air can no longer rise, cloud droplets can no longer form. The storm dies out with light rain as the cloud disappears from bottom to top. The whole process takes about one hour for an ordinary thunderstorm. Severe thunderstorms like super cells and squall lines are much larger, more powerful, and last for several hours.

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What are factors that causes of flood?
ii. How is 'Drought' caused?
iii. What is a tornado?
iv. What is an 'Avalanche'?
v. What are Cyclones?

2.2 LET US SUM UP

To conclude about this chapter, it gives us interesting information on various types of disaster with its characteristic, causes, effects, consequence and method to control theses disaster. We have learnt about the following Water and Climate related, Drainage Management, Droughts, Cyclones, Tsunami, Tornadoes, Hurricane, Hailstorms, , Cloudburst, Snow avalanches, Heat and cold waves, and Thunder and lightening. It is important to know about the various disaster types for us to keep safe, take precautions to safe us and render help to the needy people at the time of disaster.

2.3 UNIT END EXERCISE

1. Discuss the effects of floods and methods to control it.
2. List down the characteristic of tornadoes.
3. Write a short note on a) Cyclones b) Tsunami c) Hurricane
4. Explain the effects of heat and cold waves.
5. Describe the thunderstorms form with three stages.

2.4 ANSWER TO CHECK YOUR PROGRESS

(i) Floods are caused by many factors: heavy precipitation, severe winds over water, unusual high tides, tsunamis, or failure of dams, levels, retention ponds, or other structures that contained the water.

(ii) Drought is caused by not only lack of precipitation and high temperatures but by overuse and overpopulation.

(iii) A tornado is a violently rotating column of air that extends from a thunderstorm to the ground. It's often portended by a dark, greenish sky. Black storm clouds gather. Baseball-sizehail may fall. A funnel suddenly appears, as though descending from a cloud. The funnel hits the ground and roars forward with a sound like that of a freight train approaching. The tornado tears up everything in its path.

(iv) Avalanche is large amount of snow sliding down a mountainside. It can be compared to a landslide, only with snow instead of earth. It is also called a snow-slide and happens on mountains with extreme amounts of snow fall and build-up.

(v) A weather system consisting of an area of low pressure, in which winds circulate at speeds exceeding 61 km/hr, also known as 'Cyclone' or Tropical Storm.

2.5 SUGGESSTED READINGS

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UNIT III - GEOLOGICAL RELATED

Structures

3.1 EARTHQUAKES

An Earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.

Sometimes an earthquake has foreshocks. These are smaller earthquakes that happen in the same place as the larger earthquake that follows. Scientists can't tell that an earthquake is a foreshock until the larger earthquake happens. The largest, main earthquake is called the mainshock. Mainshocks always have aftershocks that follow. These are smaller earthquakes that occur afterwards in the same place as the mainshock. Depending on the size of the mainshock, aftershocks can continue for weeks, months, and even years after the mainshock!

3.1.1 Causes of Earthquakes

The earth has four major layers: the inner core, outer core, mantle and crust. (figure 2) The crust and the top of the mantle make up a thin skin on the surface of our planet. But this skin is not all in one piece – it is made up of many pieces like a puzzle covering the surface of the earth. (figure 3) Not only that, but these puzzle pieces keep slowly moving around, sliding past one another and bumping into each other. We call these puzzle pieces tectonic plates, and the edges of the plates are called the plate boundaries. The plate boundaries are made up of many faults, and most of the earthquakes around the world occur on these faults. Since the edges of the plates are rough, they get stuck while the rest of the plate keeps moving. Finally, when the plate has moved far enough, the edges unstick on one of the faults and there is an earthquake.

3.1.2 Consequences

While the edges of faults are stuck together, and the rest of the block is moving, the energy that would normally cause the blocks to slide past one another is being stored up. When the force of the moving blocks finally overcomes the friction of the jagged edges of the fault and it unsticks, all that stored up energy is released. The energy radiates outward from the fault in all directions in the form of seismic waves like ripples on a pond. The seismic waves shake the earth as they move through it, and when the waves reach the earth's surface, they shake the ground and anything on it, like our houses and us! (see P&S Wave inset)

3.1.3 Recordings of Earthquakes

Earthquakes are recorded by instruments called seismographs. The recording they make is called a seismogram. (figure 4) The seismograph has a base that sets firmly in the ground, and a heavy weight that hangs free. When an earthquake causes the ground to shake, the base of the seismograph shakes too, but the hanging weight does not. Instead the spring or string that it is hanging from absorbs all the movement. The difference in position between the shaking part of the seismograph and the motionless part is what is recorded.

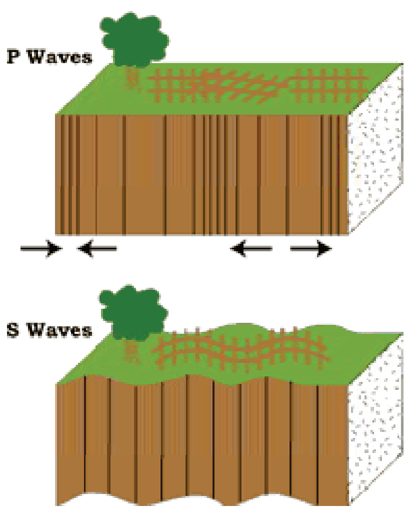
3.1.4 Size of Earthquakes

The size of an earthquake depends on the size of the fault and the amount of slip on the fault, but that's not something scientists can simply measure with a measuring tape since faults are many kilometers deep beneath the earth's surface. So how do they measure an earthquake? They use the seismogram recordings made on the seismographs at the surface of the earth to determine how large the earthquake was (figure 5). A short wiggly line that doesn't wiggle very much means a small earthquake, and a long

wiggly line that wiggles a lot means a large earthquake. The length of the wiggle depends on the size of the fault, and the size of the wiggle depends on the amount of slip. The size of the earthquake is called its magnitude. There is one magnitude for each earthquake. Scientists also talk about the intensity of shaking from an earthquake, and this varies depending on where you are during the earthquake.

3.1.5 Scientists & Earthquakes

Seismograms come in handy for locating earthquakes too, and being able to see the P wave and the S wave is important. You learned how P & S waves each shake the ground in different ways as they travel through it. P waves are also faster than S waves, and this fact is what allows us to tell where an earthquake was. To understand how this works, let's compare P and S waves to lightning and thunder. Light travels faster than sound, so during a thunderstorm you will first see the lightning and then you will hear the thunder. If you are close to the lightning, the thunder will boom right after the lightning, but if you are far away from the lightning, you can count several seconds before you hear the thunder. The further you are from the storm, the longer it will take between the lightning and the thunder.



P waves are like the lightning, and S waves are like the thunder. The P waves travel faster and shake the ground where you are first. Then the S waves follow and shake the ground also. If you are close to the earthquake, the P and S wave will come one right after the other, but if you are far away, there will be more time between the two. By looking at the amount of time between the P and S wave on a seismogram recorded on a seismograph, scientists can tell how far away the earthquake was from that location. However, they can't tell in what direction from the seismograph the earthquake was, only how far away it was. If they draw a circle on a map around the station where the radius of the circle is the determined distance to the earthquake, they know the earthquake lies somewhere on the circle. But where? Scientists then use a method called triangulation to determine exactly where the earthquake was. It is called triangulation because a triangle has three sides, and it takes three seismographs to locate an earthquake. If you draw a circle on a map around three different seismographs where the radius of each is the distance from that station to the earthquake, the intersection of those three circles is the epicenter!

Scientists have tried many different ways of predicting earthquakes, but none have been successful. On any particular fault, scientists know there will be another earthquake sometime in the future, but they have no way of telling when it will happen. (Earthquake Hazarda Program USGS)

3.2 LANDSLIDES

Landslides are simply defined as down slope movement of rock, debris and/or earth under the influence of gravity. This sudden movement of material causes extensive damage to life, economy and environment. Landslide is the most common and universally accepted collective term for most slope movements of the mass movement type. The term has sometimes been considered unsuitable as the active part of the word denotes sliding.

Landslides occur in hills / mountains in response to a wide variety of terrain conditions and triggering processes like heavy rainstorms, cloudbursts, earthquakes, floods and unsafe developmental activities. As per an assessment, more than 5000 people are buried alive under landslides and economic losses of >4 bn USD occur every year, globally (ICL, 2010). Continent-wise, Asia suffers the maximum damages / losses due to landslides in general and the south Asian nations, in particular, are the worst sufferers. Further, among south Asian countries, India is one of the most affected by landslides.

Landslides can happen not only in isolation but also along with or as a consequence of other disasters like earthquakes, floods, cyclones, lightning, cloudburst, forest fires, dam / lake bursts etc. In such cases, landslide losses are normally included within the primary disaster and hence, are not dealt separately. Thus, most of the reported estimates on landslides losses are found to be quite lower than the actual impacts of landslides on the society as a whole.

3.2.1 Impact of Landslide Disasters

The landslide disasters have both short term and longterm impacts on society and environment. The former account for the loss of life and property at the site and the latter include landscape changes that can be permanent, including loss of cultivable land and environmental impact in terms of erosion and soil loss, leading to population shift and relocation of establishments. Like in any other disaster, the most affected are the socio-economically weaker sections of the society who inhabit the vulnerable areas. They have a meager source of livelihood, which when wiped out by a hazard, leaves them without any food and shelter. Apart from this, the

injury and the casualties add to the woes of the affected families. The biggest loss is that of properties of individuals and of the government as well as damage/destruction of heritage structures. The frequent obstructions caused to the movement of traffic by numerous landslides during rainy season for days together, particularly in the Himalayan terrain and north-eastern region of the country, brings untold miseries to the people inhibiting the villages and townships in the landslide prone hilly terrains. The landslides also reduce the capacity and effective life of hydroelectric and multipurpose projects by adding enormous amount of silt load to the reservoirs. Landslide dams result in flooding of large upstream areas. Further, if the dam fails, it causes flooding and large-scale devastation in downstream areas. Also, on Comprehensive Landslides Risk Management solid landslide debris can "bulk" or add volume and density to otherwise normal stream flow or cause channel blockages and diversions creating flood conditions or localized erosion. Landslides can also cause overtopping of dams resulting in flash floods and/or reduced capacity of reservoirs to store water, for examples are Gohna and Parechhu Lake bursts.

3.2.2 Parts of Landslides – Description of Features

Accumulation - The volume of the displaced material, which lies above the original ground surface Crown – The practically undisplaced material still in place and adjacent to the highest parts of the main scarp

Depletion – The volume bounded by the main scarp, the depleted mass and the original ground surface

Depleted mass – The volume of the displaced material, which overlies the rupture surface but underlies the original ground surface

Displaced material – Material displaced from its original position on the slope by movement in the landslide. It forms both the depleted mass and the accumulation.

Flank – The undisplaced material adjacent to the sides of the rupture surface. Compass directions are preferable in describing the flanks, but if left and right are used, they refer to the flanks as viewed from the crown.

Foot – The portion of the landslide that has moved beyond the toe of the surface of rupture and overlies the original ground surface.

Head – The upper parts of the landslide along the contact between the displaced material and the main scarp.

Main body – The part of the displaced material of the landslide that overlies the surface of rupture between the main scarp and toe of the surface of rupture.

Main scarp – A steep surface on the undisturbed ground at the upper edge of the landslide, caused by movement of the displaced material away from undisturbed ground. It is the visible part of the surface of rupture.

Minor scarp – A steep surface on the displaced material of the landslide produced by the differential movement within the displaced material.

Original ground surface – the surface of the slope that existed before the landslide took place.

Surface of separation – The part of the original ground surface overlain by the foot of the landslide

Surface of rupture – The surface that forms the lower boundary of the displaced material below the original ground surface. Surface of rupture – The surface that forms the lower boundary of the displaced material below the original ground surface.

Tip – The point of toe farthest from the top of the landslide. Toe – The lower, usually curved margin of the displaced material of a landslide, it is the most distant part from the main scarp.

Top – The highest point of contact between the displaced material and the main scarp.

Toe of surface of rupture – The intersection (usually buried) between the lower part of the surface of rupture of a landslide and the original ground surface. Zone of accumulation – The area of landslide within which the displaced material lies above the original ground surface. Zone of depletion – The area of the landslide within which the displaced material lies below the original ground surface.

3.2.3 Classification of Conditions/Factors responsible for Landslides

Some slopes are susceptible to landslides whereas others are not so. Many factors contribute to the instability of slopes but the main factors indicating stability conditions are relief, drainage, bedrock, regolith, vegetation, climate, earthquake, paleo-features and man-made conditions. The

conditions/factors governing landslides can be classified as inherent (terrain) and external factors as given below.

Inherent or basic conditions

Geology

- Lithology
- Structure

Hydrologic conditions and climate Vegetation

External Factors/conditions

It include precipitation, vibrations induced by earthquake / blasting / explosion, loading or unloading of slopes etc. These factors may actually produce two different types of changes, i.e. changes in stress conditions and changes in strength of materials. The different factors producing different changes are given below for illustration.

Factors producing unfavorable changes in conditions

Those that change stress conditions

- Erosion or deposition
- Fluctuation in water level
- Seismic vibrations
- Construction activity
- Cuttings
- Reservoir fluctuations
- Land use practices

Those that change strength of materials

- Progressive softening of fissured clays
- Disintegration of granular rocks (freeze & thaw)
- Hydration of clay minerals
- Drying and cracking of clays
- Loss of cementitious material from coherent material by solution

3.2.4 Effects and Consequences of Landslides

Landslide effects can be classified as direct and/or indirect.

Direct effects – are those first order consequences which occur immediately after an event, such as deaths and damage caused by landslides directly

Indirect effects – may emerge after the landslide event and may be much less easy to attribute directly to landslides. This includes psycho-social impacts, bereavement and evacuation.

Similarly the effects may be classified as tangible and/or intangible. Tangible effects – are those to which it is possible to assign reasonable reliable monetary values, such as replacement of a damaged property. Intangible – can not be satisfactorily assessed in monetary terms; for example, loss of human life, has proved difficult to assess financially Landslides effects occur in 2 basic environments – built environment and the natural environment. Sometimes there is intersection between the two; for example agricultural lands and forest lands that are logged.

- Physical Injuries and Loss of human lives.
- Property / Infrastructural damages and economic losses
- Affect a variety of resources like water supplies, fisheries, sewage disposal systems, forest, dams and reservoirs etc.

Economic effects of landslides

- Cost of repair.
- Loss of property value
- Disruption of transportation routes
- Medical costs (injury)
- Water availability, quality and quantity

Direct Losses – are the most visible consequences of landslides. They may be comparatively easy to measure but they are not always the most significant outcome. They are caused by the immediate damage done to humans, resources and environment.
Indirect Losses – rise mainly through the second order consequences of landslides, such as disruption of economic and social activities in a community or onset of ill-health amongst disaster victims. These effects often outlast those of direct losses by months or even years and can be highly intangible.
(NIDM)

3.3 MUDFLOW

Flow of water that contains large amounts of suspended particles and silt. It has a higher density and viscosity than a stream flow and can deposit only the coarsest part of its load; this causes irreversible sediment entrainment. Its high viscosity will not allow it to flow as far as a water flow.
Mudflows occur on steep slopes where vegetation is not sufficient to prevent rapid erosion but can occur on gentle slopes if other conditions are met. Other factors are heavy precipitation in short periods and an easily erodible source material. Mudflows can be generated in any climatic regime but are most common in arid and semiarid areas. They may rush down a mountainside at speeds as great as 100 km (60 miles) per hour and can cause great damage to life and property. Boulders as large as houses have been moved by mudflows.

Mudflow deposits are poorly sorted mixtures of silt, boulders, organic materials, and other debris. They have abrupt and well-defined edges, irregular surfaces, and a lobate appearance; they may be 3 to 6 m (10 to 20 feet) high. Such deposits are extensive on alluvial fans and around the bases of many volcanoes.

Mudflows are a common natural phenomenon in mountainous regions world-wide. They are induced by heavy rainstorms or continual rainfall. Mudflows are easily triggered on steep slopes if the soils are water-saturated. Climate change may lead to more frequent heavy rainfall events (BERG et al. 2013). Thus, in mountainous regions the risk of mudflows might increase.

From a nature conservation point of view, mudflows are natural geomorphic processes which create pioneer habitats. Mudflows modify existing landforms through the formation of erosional and depositional zones and thus 72 they increase habitat diversity. Hence in protected areas mudflows should be regarded as a natural process and, therefore, restoration measures should be avoided. On the other hand, mudflows are natural disasters that cause heavy damage to buildings and infrastructure and devastate agricultural land. From an agricultural point of view, re-vegetation measures on heavily disturbed sites are necessary. Thus in protected areas there are conflicting interests concerning re-establishment of vegetation following mudslides. Today, natural initial ecosystem development can rarely be observed in Central Europe (SCHAAF et al. 2011). Therefore from a scientific point of view mudflows present a great opportunity to study ecosystem development and primary succession from the initial stage. In July 2010, due to heavy rainfall (300 mm in 2 hours) several catastrophic mudflows led to the devastation of mountain pastures in the nature park Sölktäler. Large areas (40 hectares) of grasslands were covered with mudflow deposits in the valley Schwarzenseetal. Fortunately, the disastrous mudflows did not result in any injuries, but produced substantial damage to roads and bridges. Immediately after this natural disaster 15 hectares of mountain pasture with no or sparse vegetation cover was re-vegetated since pasture was needed for livestock. In order to minimize costs a commercial seed mixture was used. The seed mixture (HR 260) contained the following 11 species: Trifoliumrepens, T. hybridum, Lotus corniculatus, Poa pratensis, Festuca rubra, F. pratensis, Phleum pratense, Dactylisglomerata, Loliumperenne, Agrostis capillaris and Cynosurus cristatus (for details see www.hesa.co.at). In addition lime, straw or farmyard manure was applied on some sown areas. The remaining areas of destroyed grasslands, especially areas next to the stream (Schwarzenbach) and on very steep slopes were left to natural succession. Despite of re-vegetation measures, the forage yield of mountain pastures is much lower than before the natural disaster two years ago. So far, the number of livestock has had to be reduced by 40 %. (Grace Young)

3.4 SEA EROSION

Coastal erosion can be defined as the removal of material from the coast by wave action, tidal currents and/or the activities of man, typically causing a landward retreat of the coastline. Coastal erosion is a mostly natural process; however, man-made structures such as piers and harbors can contribute to erosion due to restructuring of the natural environment.

There are many factors are there for cause of Coastal Erosion like natural cause, Physical Causes and Human causes.

Waves: Waves are the main cause of coastal erosion. waves striking a cliff face compress air in cracks on the cliff face. This exerts pressure on the surrounding rock, and can progressively splinter and remove pieces. Over time, the cracks can grow, sometimes forming a cave. The splinters fall to the sea bed where they are subjected to further wave action. The higher the wave energy, the higher the rate of erosion (all other things being equal). Wave energy is the result of three factors: the speed of the wind blowing over the surface of the sea, the length of fetch (i.e., the distance of sea over which the wind has been blowing) and the length of time that the wind has been blowing for. Corrasion or otherwise known as abrasion occurs when waves break on cliff faces and slowly erode it. As the sea pounds cliff faces it also uses the scree from other wave actions to batter and break off pieces of rock from higher up the cliff face which can be used for this same wave action and attrition.

Transport gradient: One cause of natural coastal erosion is an increasing gradient in transport rate in the direction of the net transport. This can be due to gradients in the wave conditions at certain stretches, a curved coastline, or special bathymetric conditions.

Loss of sand: the loss of sand inland due to breaching and over-wash of a barrier island and wind transport.

Offshore loss during extreme wave and storm surge conditions. The high waves cause the bars to move seawards and the high storm surges also cause an offshore movement of sand due to non-equilibrium in the profile during the high surge. The loss of sand to an accumulative beach at the tip of a sand spit and into deep water at the leeward of the tip of a sand spit at the termination point of a littoral cell.

Geomorphology: The geomorphology of the coastline will also affect the rate of erosion. Geomorphology is defined as the science of landforms with an emphasis on their origin, evolution, form, and distribution across the physical landscape. Geomorphologists seek to understand why landscapes

look the way they do, to understand landform history and dynamics and to predict changes through a combination of field observations, physical experiments and numerical modeling. Geomorphologists work within disciplines such as physical geography, geology, geodesy, engineering geology, archaeology and geotechnical engineering. This broad base of interests contributes to many research styles and interests within the field. An understanding of geomorphology and its processes is therefore essential to the understanding of physical geography. A wider beach will cause more wave energy to be lost due to friction before the waves can break. Shingle and pebbles will allow more water to infiltrate and cause more wave energy to be lost due to friction, while sandy beaches allow less infiltration and cause less friction and so allow for a higher rate of erosion.

Protruding areas: The loss of material from a protruding area to one or two sides is a natural cause of coastal erosion. This typically happens at till/sandstone headlands and at the tip of deltas, which do not receive sufficient material from the river due to natural shifting of the river alignment.

Geology: The geology of the coastline will also affect the rate of erosion. If the different rock types run parallel to the coastline (concordant), the sea will only be able to break through more resistant rocks in a few places. Often a gradient in the (natural) occurring longshore sediment transports is the reason of structural erosion.

3.4.1 Impact of Sea or Coastal Erosion

Coastal protection of the shoreline is rarely required, however in a few locations the dynamic shoreline has become a problem, in some cases a major and expensive problem, and in almost all of these cases the problem is related to human interference or encroachment on the shoreline. Coastal protection works, such as breakwaters, groynes, or seawalls, are usually built to guard against erosion. In doing so they harden the coast and reduce its ability to adjust naturally. Coastal erosion, which is the wearing away of coastal land or beaches, is mainly caused by the impact of waves along the shoreline. The shoreline is one of the rapidly changing coastal landforms. Shorelines are the key element in coastal GIS and provide the most information on coastal landform dynamics. Therefore, accurate detection and frequent monitoring of shorelines are very essential to understand the coastal processes and dynamics of various coastal features. Nevertheless, the researchers and engineers have been studying the several levels of the increasing complexities of wave information from offshore to near shore, the role of different technology strategies have always been helpful in drawing important conclusions and also to make their job easier.

3.4.2 Coastal Erosion Control Strategies

Hard-erosion controls: Hard-erosion control methods provide a more permanent solution than soft-erosion control methods. Seawalls and groynes serve as semi-permanent infrastructure. These structures are not immune from normal wear-and-tear and will have to be refurbished or rebuilt. It is estimated the average life span of a seawall is 50–100 years and the average for a groyne is 30–40 years.

Soft-erosion controls: Soft erosion strategies refer to temporary options of slowing the effects of erosion. These options, including Sandbag and beach nourishment, are not intended to be long term solutions or permanent solutions
(Vijeta Nehra Lecturer, Chhaju Ram Memorial (CRM) Jat College, Hisar)

3.5 DAM BURST

A dam is an engineering structure constructed across a valley or natural depression to create a water storage reservoir. Such reservoirs are required for three main purposes: (1) provision of a dependable water supply for domestic and/or irrigation use; (2) flood mitigation and (3) generation of electric power.

In providing water supply, the reservoir storage is filled during the periods of above average stream-flow. For flood mitigation, the storage reservoir is kept nearly empty during drought and periods of low rainfall, so that when rainstorms occur, the storage volume available in the reservoir provides a buffer against severe flooding events. For power generation, the storage reservoir provides a head of water upstream of the dam and the potential energy of this water is converted first to kinetic and then to electrical energy.

A large dam has two essential requirements. First, it must be reasonably watertight. Second, the dam must be stable. Movements and deformations of the dam and its foundations cannot be eliminated, but they must be predicted and allowed for in the design.

Because of these requirements, the location and design of dams are undoubtedly influenced to some extent by structural and/or geological features. It therefore follows that geological factors, and the proximity of construction materials are elements of overriding importance in determining the type of dam constructed at a given site. Once a site has been selected for a dam, consideration has to be given to deciding which

type of dam is most suited to the site. Anyway, at any site, several types of dam should be considered. In general, three factors control this final decision: (1) the topography of the dam site and reservoir area; (2) the strength and variability of the foundations and (3) the availability and suitability of construction materials.

These factors are largely controlled by the geological structure and history of the site, and an informed decision requires a great deal of geological data analysis, particularly for the second and third factors, presented in a manner that planners and engineers can use in design calculation and procedures.

When designing a large dam, the engineers have to abide by two main goals: (1) the dam must be stable and (2) the structure must be constructed as economically as possible. The two objectives are against each other: ensuring stability by over-design increases the costs, while cost-cutting methods could lead to unsafe structures.

On a worldwide scale, it is clear that the objective of constructing stable dams is not always achieved. During the 1900–1965 period, for example, about 1% of the 9000 large dams in service throughout the world have failed, and another 2% have suffered serious accidents.

It might be expected that progressive advances in dam design and construction techniques would result in lower incidence of failures. This, however, does not appear to be the case, for two main reasons.

First, with any technological advance there are always likely to be unforeseen factors that can produce unexpected problems. Second, most of the easy dam sites around the world have been utilized. This means that future dam construction will be necessary at progressively more difficult and geologically complex dam sites, which increases the probability of dam failure accidents. It is therefore clear that if dam failures and accidents are to be minimized in the future, the role of advanced technology must be enhanced during the investigation, design and construction of dam.

Records of the world's dams are kept by the International Commission of Large Dams

Dam troubles are usually reported with terms neither comparable nor classified, which can, sometimes, generate misunderstandings. According to ICOLD (1986) a failure is defined as: "collapse or movement of part of the dam or its foundations, so that the dam cannot retain water. In general, a failure results in the release of large quantities of water, imposing risks on the people and/or property downstream".

To the term “incident” is assigned the task of covering all the troubles occurred to a dam, but not degraded in “failure”, due to the timely recourse to remedial measures. The term “accident”, even if not officially codified, is used to represent the anomalies of the behavior of the structure that could have been evolved to “incidents” or also to “failures”, but whose timely diagnosis avoids any further negative progress.

An imperfect accordance between design hypotheses and reality represents, often, the decisive factor of failures. Also natural processes, such as flash-floods, rock or landslides, earthquakes or deliberate human actions, as terrorist or war attacks, can lead to dam-break events. Examples of major dam-break flooding disasters are the 1959 Malpasset dam failure in France, the 1975 Banqiao dam-break in China and the 1985 Stava dam failure in Italy.

Failure of a dam (dam-break) can result in a major disaster with devastating losses of both human life and property. The phenomenon is time-dependent, multiphase (water–soil interaction), and non-homogeneous (different materials, various degrees of soil compaction, and so on). Hydraulics, hydrology, sediment transport mechanics, and structural and geotechnical aspects are all involved in dam failures. Erosion of an earth-dam can be primed by low or weak points on the crest or on the downstream face, by piping or overtopping.

Progressive erosion then widens and deepens the breach, increasing outflow and erosion rate. Dam-break hydraulics and hydrology are topics of increasing interest in the field of water resource planning, environment protection and ecology management, given the potential occurrence of extreme meteorological events due to climate change and the catastrophic nature of historic dam failures. Prediction of the shape, magnitude, and timing of a flash flood resulting from a dam failure is important for evacuation planning and safe management of reservoir operations.

Over the recent decades, there have been continuing efforts to enhance the understanding of the theoretical background and the practical aspects involved in dam failures. Because real-time field measurements are difficult to make, the majority of dam-break studies have been carried out in laboratories. It is well-known, however, that physical experiments are largely constrained by the comparatively small spatial scales that can be realistically accommodated in laboratories and thus may not be able to fully reveal the long-term mechanisms of these processes. This applies not only to early dam-break experiments over fixed beds, but also to the recent mobile-bed laboratory tests.

As far as computational studies are concerned, most have been developed for fixed bed cases, without considering the undoubtedly strong eroding capability of the transient flow and the related morphological evolution of the channel bed. However, a dam-break flow can generate extensive debris or encounter floating debris in the valley downstream of the dam and trigger the formation of surges and shock-waves. Different methods have been proposed for the prediction of the flow depth, grain-size specific near-bed concentration, and bed material suspended sediment transport rate in sand-bed rivers.

Debris flow always has uncertainties in variables and model parameters. The properties of the moving fluid mixture of debris and water are very different from those of purely water floods. The traditional approach to debris flow studies using a physically hydraulic-based model is limited. In spite of advances made with this approach major problems and barriers exist in debris flow studies. Therefore, efforts to develop new tools for debris flow forecasting are needed.

Despite the increasing safety of dams due to improved engineering knowledge and better construction quality, a full non-risk guarantee is not possible and an accident can occur, triggered by natural hazards, human actions or just because the dam is loosing strength capacity due to its age.

Legislation and safety criteria for dams vary quite significantly throughout the world.

The majority of the contemporary safety legislation and technical guidelines promote and support dam-break flood risk management, which is a practical and important issue for public safety along the valley downstream of dams as well as for the protection of economical and environmental resources.

There are two important phases in dam-break risk management: predicting the losses or damages and their likelihood, through risk assessment, with the support of specific methods; and finding the appropriate mitigation measures, when residual risks are not acceptable.

Dam-break risk assessment defines the magnitude of the flood hazard that may occur due to a dam failure, estimates its main consequences and evaluates its significance. To assess this type of risk, it is, generally, necessary to undertake an integration between risk analysis and dam safety procedures, to evaluate the probability of dam failure, as well as numerical

dam-break flood simulations. Predicting the effects through flood simulation allows the identification of flood prone areas, the flood path and

magnitude and aims to assess valley vulnerabilities as well as losses and damages. Hazard mitigation aims at organizing the prevention measures, namely safety control requirements, to be enforced at the dam site, and emergency preparedness measures, to be implemented in the downstream valley. Issues to be addressed in this last area are: safety monitoring of dam, emergency planning and preparedness, early warning systems, rescue, relief.

These procedures introduce several problems to all organizations involved in dam exploitation as well as in dam and valley safety and civil protection. Private dam owners face a responsibility towards society in what concerns the internal dam procedures that will avoid a dam-break or diminish the probability of a dam-break flood should an abnormal event or action occur. Civil protection authorities on downstream valleys face a responsibility to diminish the probability of human and economic losses should a dam-break event occur. To mitigate the risk along the valley, defence passive procedures should be implemented as land-use control according to flood risk zoning. These procedures can cause local political resistance.

Emergency planning, and effective warning systems, are now mandatory issues in modern dam safety regulations. However, these procedures need to be implemented with the support of local authorities and with adequate public information and participation according to the risk perception level of the population at risk.

Evacuation planning needs to be well prepared and trained and in almost all real cases the alarm needs to be switch on as soon as a failure is predicted, in order to evacuate a large number of inhabitants. This condition implies:

- advanced monitoring systems with real time capability to predict with more accuracy a dam accident;

- good coordination between dam owners, dam safety authorities and civil protection authorities in order to be sure that emergency and evacuation plans are effective;

- good public information in order to guarantee a good response to flood crisis.

Dams play an important role in meeting people’s needs. Benefits include flood security, expansion of road and other infrastructures important for micro- and macro-economic development. But the last fifty years have also highlighted the social and environmental impacts of large dams. They have fragmented and transformed the world’s rivers, displaced millions of

people and often hardly provided protection against floods. Among the main reasons why in many places and so often dams fail to serve their purposes is that traditional evaluations of dams and similar public infrastructure investments often ignore related spatial– temporal risk profiles and potential negative consequences. Thousands of dams have cost much more than the original contract price; unexpected geological and hydrological features, many of which could often have been identified by more thorough investigations, are the cause of expensive problems during construction.

Too many dam sites are under-investigated, and the resultant extra cost of construction is far greater than the additional expense that would have been necessary to carry out a thorough investigation. Moreover, purely engineering evaluations of a dam are not able to account for public regulations and management of low probability – high consequence risks that exist in other human activities. Planning dams for economic development and social welfare requires the development of new spatial–temporal integrated models and decision support procedures, with the evaluation of dam safety, socio-economic, and environmental changes and developments.

With reference to these issues, the book aims to give an up-to-date review on dam-break problems, along with the main theoretical background and the practical aspects involved in dam failures, design of flood defence structures, prevention measures and the environmental, social, economic, and forensic aspects related to the topic. Moreover, an exhaustive range of laboratory tests and modelling techniques is explored to deal effectively with shock waves and other disasters caused by dam failures. Disaster management refers to programs and strategies designed to prevent, mitigate, prepare for, respond to and recover from the effects of these phenomena. To manage and minimize these risks, it is necessary to identify hazards and vulnerability by means of a deep knowledge of the causes, which lead to dam failures, and to understand the flow propagation process.

Knowledge and advanced scientific tools play a role of paramount importance in the strain of coping with flooding and other dam-break problems along with the capacity building in the context of political and administrative frameworks. All these aspects are featured in the book, which is a comprehensive treaty that covers the most theoretical and advanced aspects of structural and hydraulic engineering, together with the hazard assessment and mitigation measures and the social, economic and forensic aspects related to subject.

3.6 DAM FAILURES

A dam failure or dam burst is a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. Between the years 2000 and 2009 more than 200 notable dam failures happened worldwide.

A dam is a barrier across flowing water that obstructs, that directs or slows down the flow, often creating a reservoir, lake or impoundments. Most dams have a section called a spillway or weir over or through which water flows, either intermittently or continuously, and some have hydroelectric power generation systems installed.

Dams are considered "installations containing dangerous forces" under International humanitarian law due to the massive impact of a possible destruction on the civilian population and the environment. Dam failures are comparatively rare, but can cause immense damage and loss of life when they occur. In 1975 the failure of the Banqiao Reservoir Dam and other dams in Henan Province, China caused more casualties than any other dam failure in history. The disaster killed an estimated 171,000 people and 11 million people lost their homes.

Main causes of dam failures

- Common causes of dam failure include:
- Sub-standard construction materials/techniques (Gleno Dam)
- Spillway design error (near failure of Glen Canyon Dam)
- Lowering of dam crest height, which reduces spillway flow (South Fork Dam[4])
- Geological instability caused by changes to water levels during filling or poor surveying (Malpasset Dam).
- Sliding of a mountain into the reservoir (Vajont Dam – not exactly a dam failure, but caused nearly the entire volume of the reservoir to be displaced and overtop the dam)
- Poor maintenance, especially of outlet pipes (Lawn Lake Dam, Val di Stava dam collapse)[5]
- Extreme inflow (Shakidor Dam)
- Human, computer or design error (Buffalo Creek Flood, Dale Dike Reservoir, Taum Sauk pumped storage plant)
- Internal erosion or piping, especially in earthen dams (Teton Dam)
- Earthquakes

3.7 MINE FIRES

A coal-seam fire is a natural burning of an outcrop or underground coal seam. Most coal-seam fires exhibit smoldering combustion, particularly underground coal-seam fires, because of limited atmospheric oxygen availability. Coal-seam fire instances on Earth date back several million years. Due to fine thermal insulation and the avoidance of rain/snow extinguishment by the crust, underground coal-seam fires are the most persistent fires on Earth and can burn for thousands of years, like Burning Mountain in Australia. Coal-seam fires can be ignited by self-heating of low-temperature oxidation, lightning, wildfires and even arson. Coal-seam fires have been slowly shaping the lithosphere and changing atmosphere, but this pace has become fast and extensive at modern times, triggered by enormous mining activities.

Coal fires are a serious health and safety hazard, affecting the environment by releasing toxic fumes, reigniting grass, brush, or forest fires, and causing subsidence of surface infrastructure such as roads, pipelines, electric lines, bridge supports, buildings, and homes. Whether started by humans or by natural causes, coal seam fires continue to burn for decades or even centuries until either the fuel source is exhausted, a permanent groundwater table is encountered, the depth of the burn becomes greater than the ground's capacity to subside and vent, or humans intervene. Because they burn underground, coal seam fires are extremely difficult and costly to extinguish, and are unlikely to be suppressed by rainfall. There are strong similarities between coal fires and peat fires.

Across the world, thousands of underground coal fires are burning at any given moment. The problem is most acute in industrializing, coal-rich nations such as China. Global coal fire emissions are estimated to cause 40 tons of mercury to enter the atmosphere annually, and to represent three percent of the world's annual CO2 emissions.

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. How many layers does the earth have?

ii. Where does the landslide occur?

iii. Define Coastal erosion?

iv. What are the causes of dam failures?

3.8 LET US SUM UP

In continuation with chapter -2, this chapter gives us the clear idea about geological related disasters, such as earthquake, Landslides, mudflows, sea

erosion, and dam relation disasters. The indications of the above mentioned related issues are put in plain words for your understanding.

3.9 UNIT END EXERCISE

1. Explain the causes, consequence of Earthquake.
2. Discuss the impact of landslides.
3. Highlight the control strategies of Coastal Erosion.
4. Write a note on the following a) Dam Bursts b) Dam Failures c)Mine Fires

3.10 ANSWER TO CHECK YOUR PROGRESS

i. The earth has four major layers: the inner core, outer core, mantle and crust.
ii. Landslides occur in hills / mountains in response to a wide variety of terrain conditions and triggering processes like heavy rainstorms, cloudbursts, earthquakes, floods and unsafe developmental activities.
iii. Coastal erosion can be defined as the removal of material from the coast by wave action, tidal currents and/or the activities of man, typically causing a landward retreat of the coastline
iv. a) Sub-standard construction materials/techniques, b) Spillway design error, c) Sliding of a mountain into the reservoir

3.11 SUGGESSTED READINGS

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UNIT IV – CHEMICAL RELATED

Structure

4.1 ROAD, RAIL, TRANSPORTATION ACCIDENTS INCLUDING WATER WAYS – BOAT CAPSIZE

Railways are cone of the most prominent modes of transportation in the world. Indian Railways is one of the largest railway systems in the world and is fully owned and operated by Ministry of Railways, Government of India. It plays a significant role in driving economic growth of the country, offering highly affordable, environment-friendly transportation to passengers and freight, especially bulk commodities, across the country. Indian Railways, like any other transportation system, is technology intensive not only for ensuring high productivity of its assets but also safety in train operations (Government of India 2012)

Indian Railway (IR) is a vast system comprising of nearly 64,000 route kilometers with over 7000 block stations and holding nearly 9000 locomotives, 43500 passenger coaches, 7500 electrical and diesel multiple units and 220 thousand wagons. Further the IR system has 13.62 lakh strong work force, handles 20 million passengers and 2.45 million tonnes of freight and earns ₹245 crores on daily basis (Government of India) which makes the Indian Railway network (IRN) one of the busiest railway networks in the world, handling massive numbers of passengers and

quantities of goods daily (Banerjee 2011). The IR has long served as the backbone of this nation's economy by being the most popular means of long distance transportation in India. Besides the huge network, heavy traffic, over-saturation of rail tracks, extreme weather conditions and many more challenges; IR is com-mitted to safe journey to avoid loss of life and property through continuous modernization and strengthening the infrastructure, adopting latest technologies, engagement of experienced and trained manpower, periodic maintenance and checkups, safety audits etc. Indian railway also has its own disaster management plan to manage the railway accidents in all the phases viz. pre, during and after the disaster. But the safety on the railways is the end product of the coordination among all the factors. A single flaw in the complex network of track that crisscross the country, a defect in over several hundred locos, coaches and lakh of wagons that haul about millions of passengers and nearly several million tonnes of freight every day, an incorrect indication on one of the thousands of signals that dot the rail landscape, a mistake or an act of negligence by one of its staff directly associated with train running, even a rash act by one of the millions of road users who daily negotiation around odd level crossing gates spread across the system, an irresponsible act of carrying inflammable goods, any one of these multiple possibilities has the potential to cause a major tragedy. Added to these are the acts of sabotage by misguided elements spanning the whole country (Ministry of Railways 2014a). The consequential train accidents include mishaps with serious repercussion in terms of loss of human life or injury, damage to railway property or interruption to rail traffic in excess of laid down threshold levels and values which include collisions, derailments, fire in trains, road vehicles colliding with trains at level crossings, and miscellaneous train mishaps. The train accidents trends, fatalities, causes and management has been continuously studied worldwide (Rautji and Dogra 2004; Aguirre et al. 2013); the human error induced factors being the major contributor for railway accidents. The railway accident analy- sis in different countries like Britain (Santos- Reyes et al. 2005; Evans 2011a), Europe (Evans 2011b), Australia (Baysari et al. 2008), Indonesia (Iridiastadi and Ikatrinasari 2012), United Kingdom (Kyriakidis et al. 2015) and China (Liu et al. 2015) supports the argument

The study of railway accidents that occurred during last 16 years (2000-2016) revealed that, there are four major categories of accidents viz. derailment, level crossing accidents, collisions and fire in trains. The rest were categorized under miscellaneous accidents

Total 3515 accidents occurred during the study period in which the major accident type was train derailment followed by level crossing accidents. The accident type which occurred in Indian Railways over the years

followed the trend Derailment > Level crossing accidents > Collisions > Fire in trains > Miscellaneous accidents The year wise total accidents ranged between 107 and 473. The highest number of total railway accidents occurred in the year 2000-01 and a gradual decrease in total number of accidents in the subsequent years except in the year 2014-15 in which total 135 accidents were reported (higher than previous three years). The data revealed that the accidents occurred with an average of 220 accidents per year.

Level Crossing Accidents

Major accident type in Indian Railway after derailments. The average level crossing accidents occurred at a rate of 70 accidents per year (2000-2016). There was no significant decrease in the level crossing accidents over the 16 years. The highest level crossing accidents occurred in 2002-03 (96) followed by 2003-04 (95) whereas the lowest were recorded in the year 2015-16. During the 16 year period, total 1125 level crossing accidents were recorded in Indian Railway.

Collisions

The collision is the third major accident type having huge potential to cause very severe impact on life and property in Indian Railways. The data revealed that, there were 167 collisions that occurred during 2000-2016 in Indian Rail ways. The highest number of collisions were recorded in the year 2001-02 (30) followed by 2000-01 (20). The annual mean collisions in Indian Railway were 10 per year. A decreasing trend in the collisions was observed in Indian Railways over 16 year period

Fire and Miscellaneous

The fire in trains and miscellaneous accidents are the least contributor to total railway accidents in Indian Railways. Thus, the 16 year (2000-2016) Indian Railway accident data revealed that total accidents and type of accidents found decreasing trend over the years in IR

Causes of Railway Accidents

The trends pertaining to the year wise causes of railway accidents in Indian Railways has been presented in Table 2. The data revealed that, out of 3515 accidents that occurred during 2000-2016, 2989 accidents were caused by human error, 164 caused due to equipment failure, 155 were due to sabotage and 168 were due to other reasons whereas the causes of 39 accidents has not been identified or these are under investigation. Thus, the human error is the principal cause of the accidents occurred in Indian Railway over 16 years. The annual mean cause data showed that, failure of

equipments, sabotage and other causes contributed equally towards occurrence of railway accidents. The year wise accidents caused due to human error were found decreasing in subsequent years except in 2005-06 and 2014-15. The reduction in the human error induced accidents indicated adaptation, upgradation and utilization of technological advances by Indian Railway. The railway disaster incident due to failure of equipments during 2000-2016 ranged from 0 to 33. The highest equipment failure occurred in 2000-01 and it continuously reduced and touched zero in 2008-09 but it again started and existed till 2014-15 which shows poor maintenance and management of railway equipment by Indian Railway Staff. The railway disaster due to sabotage was recorded higher in initial years which gradually decreased. The railway incidence due to sabotage ranged from 1 (2014-15) to 19 (2000-01) during the data studied (2000-2016). The sabotage activity was found higher during 2000-2003 and 2007-2010 as compared to the 2004-2006 and 2011-2015 (Table 2). The decrease in the sabotage activity revealed the improvement in the Railway Protection Force (RPF) and coordination of Indian Railway with other departments.

The cause other than human error, sabotage, equipment failure also contributed for 168 railway accidents out of 3515 during the 16 year data analysis. The cause of 39 accidents were either not identified or under investigation. Thus, human error, failure of equipments and sabotage were the major causes of accidents in Indian Railways. Indian Railway successfully over came these causes but needs further improvement to eliminate the railway disasters completely or avoiding the loss of life during the accidents(Government of India 2014).

Impact of Railway Accidents

Casualties and Victims

The data pertaining to the year wise casualties, person injured and a total affected person has been presented in Table 3. In last 16 years (2000-2016), 2297 people lost their life in railway accidents and 6088 people got injured affecting a total of 8385 people in the country. The casualties in accidents ranged between 40 and 315 in the year 2015-16 and 2005-06, respectively. Similarly, the year wise injured people ranged from 94 in 2013-14 to 658 in 2002-03. The total people affected due to railway accidents was found lowest in the year 2013-14 (136).

Whereas the highest number of victims was recorded in 2002-03 (815). The annual mean data showed that 524 people were affected each year during 2000-2016, out of which, 144 lost their life and 381 left injured.

In last 16 years Indian Railway faced a total loss of ₹86486 cr. due to accidents. Thus, Indi an Railway lost ₹5405 cr. per year due to accidents. The total loss to Indian Railway due to accidents ranged between ₹3235 cr. (2004-05) and ₹9493 cr. (2011-12). Out of total loss of ₹86486 cr. during 2000-2016, Indian Railway paid ₹6412 cr. towards the compensation to the incident victims and rest ₹80073 cr. Faced for permanent plus rolling stock. The Indian Railway faced a total loss of ₹61620 cr. During the 16 year under study as loss due to rolling stock. The rolling stock loss was found highest in the year 2011-12 (₹8210 cr.) followed by 2014-15 (₹6313 cr.). The lowest loss in rolling stock was observed in 2013-14 in which railway faced a loss of ₹2003 cr.

Similarly, the Indian Railway lost ₹18453cr. as loss in permanent way due to accidents during the period under study. The permanent loss to Indian Railway averaged as ₹1153 cr. per year in last 16 years. The highest permanent way loss of ₹1831 cr. was recorded in 2000-01 followed by ₹1799 cr. in 2013-14, whereas the least loss in permanent way of ₹497 cr. burdened Indian Railway in 2004-05. Indian Railway paid ₹6412 cr. towards compensation to incident victims in last 16 years under study which averaged ₹401 cr. per year. The compensation paid by Indian Railway to accident victims ranged from ₹121 cr. (2007-08) to ₹886 cr. (2000-01) during 2000-2016. Thus, a huge amount of ₹86486 cr. was lost by Indian Railway due to accidents.

(S. B. Aher* and D. R. Tiwari1)

Waterways – Boat Capsize

In a word, instability. Boats are inherently stable until something causes them to become unstable. And that something is weight — where it is and how much it is determines when a boat will tip over far enough to capsize or fill with water.

A capsize is defined as a boat rolling over onto its side or completely over; swamping typically means that a boat fills with water (often from capsizing) but remains floating. So to simplify, we'll use the term capsize from here on. As mentioned, boats capsize because they become unstable, but there are three main reasons for that instability: too much or unbalanced crew or equipment weight; leaking water, which also creates too much weight; and bad weather, which causes instability as a boat is rocked and filled with water.

There is always a very real possibility of injury when passengers unintentionally go in the water with nothing to hold onto. The U.S. Coast Guard (USCG) has addressed this by requiring monohull powerboats built

after 1972 under 20 feet in length to float when filled with water. This is a good thing, because without it, most of the small boats in the study would have sunk out from under the crew, leaving nothing to hang onto while waiting for rescue. The bad news is that boats larger than 20 feet that don't have built-in flotation will eventually sink if capsized, and even smaller boats with flotation can still sink if grossly overloaded. (Note: Boats up to 26 feet built to the American Boat & Yacht Council (ABYC) standards adopted by the National Marine Manufacturers Association (NMMA) also have flotation). Inboard and sterndrive boats have less rigorous basic flotation requirements than outboard-powered boats. If your boat was built before 1972, it wasn't required to — and probably won't — have flotation at all. Small boats are most likely to capsize. Almost 10 percent were 8-footers, mostly dinghies, and capsizes here often didn't cause much damage. But the biggest group, according to a Boat US study were the 15-19 footers, representing 41 percent of all capsizes. These boats were typically fishing boats, often with large, hard-to-drain cockpits, sometimes out in poor weather, and were sometimes overloaded.

The next most common group are boats in the 20-24-foot range, representing a quarter of the total; half of those were outboard-powered 22-footers. Larger boats tend to be more stable and rarely capsize, though there were several boats over 38 feet that capsized.

Nearly all capsizes can be assigned one of three causes. **The most common is too much or poorly distributed weight.** Small boats are much more susceptible to an extra person or two or a couple of heavy coolers aboard than larger boats. Older boats especially may have gained weight over the years as more gear is stored aboard. On boats with cockpit drains, an extra beefy friend or a second cooler might be all it takes to make the water come back in through the drains, filling the boat. While most of these under-20 foot boats are required to have flotation, they also must have a capacity plate that states how much weight and how many people can safely be aboard. Pay attention to this number, and keep in mind that the number of seats in a boat is not always an indication of the number of people it can carry safely. Exceeding the capacity limits, even in calm water, is asking for trouble; and in many states, operators can be ticketed for it. All it takes is a stiff wind, a large wake, or an unbalanced load to flip over.

The bottom line is that loading too much cargo or too many passengers in one part of the boat can affect its stability, even if the total load is within the boat's maximum capacity. Weight needs to be evenly distributed, especially in smaller boats. One other thing worth mentioning is that capsizes can also be caused by modifications that affect the stability of the

boat. Even a small tuna tower can severely change the center of gravity, especially on a smaller boat.

The second major cause of capsizing is leaks. Sometimes it's as simple as forgetting to put the drain plug in; other times it's leaking fittings. Water sloshing around in the bottom of the boat affects stability and waves or a wake can cause it to flip. Tying the drain plug to your boat key is a simple way to remember the plug. On the other hand, leaking fittings that can fill the boat with water are usually out of sight, often in livewells and bait boxes. Several claims were reported when an owner installed a livewell fitting using cheap PVC pipes and valves, and at least one livewell had no shut-off valve at all with no way to stop the ingress of water once it began leaking. Any fitting that penetrates the hull needs to be closeable and should be made from stainless steel, bronze, or Marelon. One more thing the claims revealed: Some livewells are plumbed in such a way that they'll flood the boat if the valve is left open while underway.

Many older outboard-powered boats have low transom cutouts that can cause the boat to flood simply by slowing down too quickly, especially with excess weight in the stern. Newer outboard boats have a well that reduces the risk.

Some boats have cockpits that drain into the bilge (generally considered a poor design), requiring the use of a bilge pump to even stay afloat. Bilge pumps are designed to remove nuisance water only, not to keep a boat from sinking. If your boat's cockpit drains into the bilge, be aware that if the bilge pump fails, your boat can fill with water and capsize or sink.

Weather is another major cause of capsizes, sometimes in concert with overloading. Small boats are easily overwhelmed by modest waves or even wake, especially if they've got a full load and sit low in the water. A sudden squall can flip even a larger boat. Check the weather forecast before you go out, and keep a weather eye on the sky. In most areas, NOAA broadcasts continuous weather via VHF radio. If you're within range, smartphone apps can show you detailed weather maps, including radar, which can indicate approaching storms. Weather changes quickly on the water, so at the first sign of bad weather, head back to the dock. If you're caught out in a squall, have your passengers stay low near the center of the boat to maintain stability. (Scott Marine Surveyors & Consultants, 2017)

4.1.1 Mine Flooding

4.1.2 Major Building Collapse

Building components tend to fail depending on materials, designs, method of construction, environmental conditions and the use to which the building is put. Substandard materials and design errors are major causes of component failure.

Some of the main causes for building collapses are bad design, faulty construction, foundation failure, extraordinary loads, unexpected failure modes or a combination of causes. But collapses also occur due to natural disasters such as earthquakes, floods, hurricanes, cyclones and fires**.**

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Many structural failures have been the consequence of poor technical research and knowledge. As technical awareness gets better, errors are becoming by far the major cause of known structural collapses, mainly in technologically advanced countries. An error in this situation is a gross error or mistake, not a negligible computation error or construction divergence.

Common construction faults

Inappropriate construction

The contractor's failure to build in accordance with drawings and specifications can also add to failure of structures. Use of inferior or sub-standard building materials is another reason buildings fail. Overloading during the life span of a building can critically weaken the structural reliability of it. Extra loads due to unauthorised change of use or additions and alterations to the structure can intensify an under-designed building and can contribute to its eventual failure.

Performance failures

Performance failure can be described as an intolerable difference between anticipated and existing design and construction. The engineer's design interpretation must be put aside at the construction stage for the structure to be effectively constructed. Failure may occur due to consultants' and contractors' inadequate supervision and control of site operations and quality control. Such errors ultimately lead to a situation, which may involve such failures, which are related to excavation and equipment, inappropriate sequencing, not enough temporary support; unnecessary structure weight; untimely taking away of shoring or formwork; and non conformance to design objectives.(Mohammed Azad Hossain, 2009)

4.1.3 Serial Bomb Blasts

A bomb is an explosive device made up of usually some kind of a container filled with explosive material; designed to cause destruction when set off .The explosion of the bomb has to be triggered, usually a clock, a remote control, or some kind of sensor, usually pressure (altitude), radar, or contact. The description and adaptation or preparations of an explosive is defined in section 4 (d) of Indian Explosive Act 1884. (2) Explosions can be atomic, mechanical and chemical. A bomb blast is a type of chemical explosion. Explosives are classified into low and high explosives. Primary high explosives like mercury fulminate and lead azide are too sensitive to be used in bulk and are ideal for detonators. Secondary high explosives are less sensitive and do not explode on handling. To produce an explosion they must be subjected to shock wave from other detonating explosive, usually supplied by a detonator or blasting cap.

One of the places attacked in this study, Ganesh Guri, is the most bombed site (this was 19th time) in India. The bomb was planted in a car parked under the flyover. Similarly all other places which were targeted are among the most crowded placed. Maximum numbers of cases were seen in the age group of 20-40 years as persons in this age group are mostly the bread earners of their family and go out for other household works too. In India, being a patriarchal society, most of the outdoor activities are performed by male. So, male were common victims in this attack. Most of the people dying in the blast were from Guwahati but the city being business centre of Assam, people from other parts of the state were also commonly involved. As the attack targeted most crowded business centres the blasts victims were predominantly people engaged in their own business.

Closed space explosions cause an increase in mean injury severity scores, primary blast injury in admitted patients and overall mortality. [5] Patients injured in open spaces are more likely to suffer from penetrating injury and

less likely to suffer from the effects of the blast wave compared with patients injured in semi confined spaces and buses. Victims in proximity to the epicentre of the blast are more severely injured than the victims farther away. The most severe types of thoracic injuries after terrorist attacks are caused by penetrating missiles. Abdominal organs such as liver, spleen and kidneys, which are partially protected by the rib cage, are less frequently injured. [8] Blast induced burns are present in up to 27% of the people injured by an explosion and is associated with immediate mortality and a high rate of coexisting primary blast injury. [5] In our study the most common part of the body injured was combined thorax and upper limbs. Burns was most common type of injury seen on dead bodies of the victims. Burn injuries were common in this attack as the bombs were planted in car or two wheeler in parking due to which the vehicles standing by the side caught fire. Bomb blasts with heavy casualties present an unusual circumstance in the mortuary. In present study there were hundreds of emotional relatives to identify the bodies and they wanted quick disposal of their cases. Deficiency of police made it more difficult to control the crowd and it created a law and order situation. The staff in mortuary was not sufficient to deal with such a large number of cases and request for more paramedical staff & sweepers were sent to hospital administration immediately. District administration was asked to send executive magistrates and police personnel; to control the law & order situation, to conduct the inquest & other documentary formalities as early as possible. Whole staff was called on duty for faster disposal of cases. The prime objectives of the necropsies are identification, documentation of the injuries and reconstruction of the events. [7] In present study, 49 bodies were identified by the relatives on the basis of facial features, clothes and personal belongings. Out of 7 charred bodies, 4 were identified the same day based on belongings and 1 was similarly identified next day. Last 2 bodies were claimed by more than 2 families for which samples for DNA analysis were sent to SFSL Kahilipara, (Guwahati) for identification. Human intelligence is central in preventing such type of terrorist attacks. People are to be more vigilant and should inform the police immediately if they notice any suspicious object or person. Law enforcement agencies should be strengthened for routine checkup of vehicles. Unlawful use of LPG cylinders for fuel should be severely punished. Parking laws should be properly enforced. Proper technologies like CCTV cameras should be installed in markets & crowded places to nab the culprits. Understanding the modus operandi of the terrorists by security agencies may help in nabbing the culprits and preventing terrorist attacks. (Yogender Malik, **Ritu Raj Chaliha, 2012, Vol. 34, No. 1)

4.1.4 Festival Related Disasters

Religious festival can very easily be the reason for the loss of innocent lives.

Maha Pushkaralu Festival, Andhra Pradesh, July 2015

Over 1500 crores were spent by the Andhra government for the 12-day festival of 'Maha Pushkaralu'. Supposed to happen only once every 144 years, based on astronomical calculations, this festival was understandably of very high importance among the believers. Sadly however, the banks of river Godavari turned into a brutal death trap when 27 people, most of them elderly women, died in a morning stampede on the first day of the festival. Tragedy struck when a woman fell down in a crowd that was pushing through a narrow entrance to the ghat just minutes after it was opened to the general public. Nearly three crore people reportedly attended the twelve day festival that coincided with the beginning of the larger Kumbh Mela festival that took place in Nashik this year. Even though the Andhra government, and the police authorities were aware of the number of people coming down for the event, they were clearly not prepared to handle a crowd of such magnitude, eventually resulting in unfortunate loss of lives.

Navaratri, Madhya Pradesh, October 2013

On October 13, 2015, disaster struck in the Datia district of Madhya Pradesh during the yearly celebration of Navratri. About 5,00,000 people had congregated at Ratangarh Mata temple. Around 9 in the morning, around 25,000 people were on the bridge that needed to be crossed for the temple. A section of the bridge's railing broke when a rumour spread that the bridge was about to collapse. You can imagine the chaos that was to follow. The crowd panicked and began pushing their way off the bridge. More than 110 people came out injured, approximately 115 didn't come out at all (actual number of the death toll was reportedly somewhere around 400). Most were killed in the stampede while there were quite a few who drowned after jumping off the bridge into the swelling Sindh river. Most of those who lost their lives were women and children.

Two Years down the line, people are still unsure about what actually could've caused the breakout. One report said the rumour of the bridge's impending collapse began when a section of the railing broke, but another said the bridge had been hit by a tractor before the stampede. Some said a group of pilgrims intentionally spread the rumour, hoping to cut the long line, while some witnesses said the stampede started when the police

charged into the crowd wielding canes. The allegation was denied by police officials.

Maha Shivratri, Junagadh, February 2012

Two Men, three women, and a child lost their lives because of a stampede on the 19th of February, 2012 at the Junagadh's Bhavnath fair during Mahashivratri. More than two dozen people were also injured after a bus caused a traffic jam in the area that couldn't be resolved for hours. Over a million devotees attend the five-day fair, making it Gujrat's largest annual mass gathering. At the time the stampede broke out there were reportedly around 9 lakh people at the fair. Not undermining those who lost their lives and the thirty odd who were left injured, but the death toll could've very well been higher, very easily.

Makara Jyoti, Sabarimala, January 2011

Pilgrims were returning from a Hindu shrine on 14th of Januray 2011, the last day of the Makara Jyoti festival which attracts millions every year, when a stampede broke out at Pullumedu near Sabarimala in Kerala. Various media agencies had various accounts of what went down at eight at night when the devotees were on their way back down the hill. An SUV (possibly broken down) had reportedly blocked the path. When it moved, it might have caused people to stumble over, triggering the stampede. There is another report which said a large number of people were running down the hill towards the road which was already packed with vehicles. Some even say it was because of an accident between an autorickshaw and a jeep. The real reason still remains a mystery since the spot where the stampede broke out, which eventually injured 100 and killed 106, is an open field.

Navatri, Jodhpur, 2008

What could've been another day of celebrations during the festival of Navratri, turned into a horrific story of death because ostampede at the Chamunda Devi temple at the Mehrangarh Fort in Jodhpur on 30th September 2008. About 25,000 pilgrims had gathered by the time the door to the temple opened. Pushing and shoving resulted in the destructions of the barricades laid out for the public. The path leading to the temple was very narrow, without any emergency exists laid out for the thousands gathered. More than 425 people very injured, and over 224 died a tragic death. Again, there were various reasons reported for the stampede to break out. Local reports suggested that a

bomb blast nearby caused the crowd to panic, while BBC reported that a collapsing wall may have also played a part. Some eyewitnesses told the media that a rumour of a bomb planted in the temple made the pilgrims lose their calm, while some also said that some devotees in the men's queue had slipped which resulted in the massive stampede. Extremely unfortunate.

Jagannath Yatra, Orissa, 2008

The Rath Yatra is a massive event in the temple town of Puri, which attracts a crowd of multiple lakhs every year. The police say there were about 5,00,000 people on that fateful day. During the main event of the chariot festival a stampede broke out which killed at least six, and left dozens injured. Graphic CCTV footage of the incident emerged which showed a limp woman in a pink saree somehow being pulled out of the crowd and carried away on a stretcher.

Mandher Devi annual pilgrimage, Maharashtra, 2005

Very Possibly one of the worst man-made disaster's of the country where hundreds were crushed and burned to death in an electrical fire and a stampede. Over 3,00,000 people converged on the hill-top Mandher Devi temple for the annual pilgrimage in the small town of Wai. According to the account of the witnesses, the stampede began around midday when some pilgrims lost their footing on the climb, which had become wet from broken coconuts. This was followed by a fire which broke out in shops nearby and gas cylinders exploded. Hundreds were crushed to death on the steep and narrow hill, while the others were charred. About 350 people died from the mishap and hundreds more left injured.

Kumbh Mela, Nashik, 2003

Amost Every Indian is aware of how monstrous Kumbh Melas tend to get, population wise. Things can go really bad really fast, in a place like the Kumbh. Just like on August 27th, 2003 when the Kumbh was happening in Nashik near the Godavari river. The incident claimed the lives of around 40 devotees while injuring 125 more when people had gathered to take the holy bath.

Mahakumbh Mela, Allahabad, 1954

The 1954 Mahakumbh disaster was perhaps the worst in the country as far as the loss of lives are concerned. It was the main bathing day at the Mahakumbh. During those days, the politicians would take advantage of

the gathering of lakhs at the Kumbh, and to make the event all the more special, this was also the first Kumbh after India's independence.

The Blame shouldn't be directed towards the authorities for failing to control the crowd because the holy river of Ganga had also changed its course and moved closer towards the embankment, and the city. This reduced the space available for people, making it more restricted. A surge of crowd eventually broke through the barriers resulting in a stampede where more that 800 people died, and over 2000 were injured in some way or the other. PM Jawaharlal Nehru condemned the tragedy and suggested that politicians and VIPs may not visit the Kumbh Mela in the future. Right now, Kumbh is the largest gathering of people in the world with over 100 million people attending.

These Festivals are as dangerous as we are. A little bit of caution, and better management by us could've saved all the lives that were lost in the tragedies mentioned above.

4.1.5 Electrical Disasters

Therefore, the Indian Electricity Rules, 1956 stand repealed with the making of these regulations. The making of these regulations. Relevant safety related provisions in this regulation are: Regulation 3 - Designated person(s) to operate and carry out the work on electrical lines and apparatus.

Regulation 12 - General safety requirements pertaining to construction, Installation. Protection, operation and maintenance of electric supply lines and apparatus.

Regulation 13 - Service lines and apparatus on consumer's premises.

Regulation 14 - Switchgear on consumer's premises.

Regulation 15 - Identification of earthed and earthed neutral conductors and position- of switches and switchgear therein.

Regulation 17 - Accessibility of bare conductors.

Regulation 18 - Danger Notices.

Regulation 19 - Handling of electric supply lines and apparatus.

Regulation 20 - Supply to vehicles and cranes.

Regulation 21 - Cables for portable or transportable apparatus.

Regulation 22 - Cables-protected by bituminous materials.

Regulation 23 - Street boxes.

Regulation 24 - Distinction of different circuits.

Regulation 25 - Distinction of the Installations having more than one feed.

Regulation 26 - Accidental charging.

Regulation 27 - Provisions applicable to protective equipment.

Regulation 28 - Display of instructions for resuscitation of persons suffering from electric shock.

Regulation 29 - Precautions to be adopted by consumers, owners, - occupiers, - electrical contractors, electrical workmen and suppliers

Regulation 30 - Periodical inspection aid testing of installations.

Regulation 31 - Testing of consumer's installation:

Regulation 32 - Installation and testing of generating units.

Regulation 39 (2)- The supplier shall take all reasonable precautions to avoid any accidental interruptions of supply, and also to avoid danger to the public or to, any employee or designated person when engaged on any operation during and in connection with the installation, extension, replacement, repair and maintenance of any works.

IS and other standards to be followed:

Beside above regulations, the following code of practice as per IS & Standards shall be referred for construction, operation & maintenance of lines / sub-stations.

1) Code of practice for Earthing (IS3043 – 1966)
2) Code of practice for installation & maintenance of transformer (IS1886 – 1961)
3) Code of practice for selection, installation and maintenance of transformers (IS10028 part-III – 1981)
4) Specification of insulating oil for transformers and switchgear (IS335 – 1963)
5) Code of practice for maintenance of insulating oil (IS1866 – 1961)
6) Guide for safety procedure and practices in electrical work (IS 5216 – 1969)

7) R.E.C. safety manual 3/1974
8) R.E.C. specifications and construction standards 1/1971 & 1981
9) R.E.C. manual 6/1976 installation & maintenance manual for 33/11 KV sub-station.
10) R.E.C. manual 7/1975 maintenance manual for 33 KV, 11 KV lines, medium & low voltage lines.
11) R.E.C. manual 10/1976 manual for design of 33/11 KV substations for rural electrification system.

Reasons for accidental contact with live electric wire / equipment:

a) This is one of the most common reasons for accident with the employees / operating staff of the utilities.
b) Operating staff not properly skilled / trained.
c) Similarly, the work is not being supervised by qualified personnel
d) Inadequate ground clearance / operational clearance of the live parts.
e) Ignorance about the discharging line / equipment before starting of maintenance work / repair works.
f) Error in isolation of supply.
g) Non-availability of safety tools & devices (as per IE Rule 36)
h) Absence of clear instructions and supervision i.e. standard codified maintenance manuals should be prepared which will guide the maintenance personnel to follow the standard instruction including line clearance / return procedure.

Remedial measures to avoid violation / neglect of safety measures / lack of supervisions:

1. Formulation of safety policy
2. Training to the workforce
3. Enforcement of safety practices
4. Adequate supervision
5. Fast acting protection relays / releases may be considered for distribution lines.

Remedial measures to avoid unauthorized work / Sub-standard construction/ defective appliance/apparatus/tools:

Around 6 to 7% of the reported cases of accidents / / fatalities (in Orissa state) are due to the reason of un-authorised work / defective appliances / apparatus etc.
Unauthorized work should be checked in accordance with the various available legal / mandatory provisions.

Scrupulous follow up of various quality control orders of Govt. may help in reducing the large number of accidents caused by sub-standard appliances / equipment.

The owners of the installation should provide approved type of safety tools and protective equipment to operating staff / workmen and ensure use of safety devices.

General precautions to be taken:

1) Consider safety aspects during planning of work
2) Explain the area which is safe to work & ensure that entire team has understood the same
3) Restrict entry of unauthorized persons
4) Nominate one among the team exclusively for close watch during the work
5) Only authorized work men should be allowed to climb the pole, structure, work on line
6) Work on live line should be done with due permission from the competent authority and under the supervision of a qualified officer.
7) Before switching on any equipment, check that equipment is in perfect working order and t is properly earthed.
8) Use rubber hand gloves, rubber boots, aprons, safety helmets etc. while operating circuit breaker, GOD etc.
9) Do not bring food or snacks into the working area like control room, switch yard etc.
10) Use proper pulley block & rope slings for lifting and removing heavy loads since incorrect and careless handling can cause accidents.
11) Position in correct and stable posture while working
12) Live wire should never be exposed
13) Use correct size and quality of fuse wire
14) Do not use sub-standard material
15) Always ensure that all blades of GOD are operated
16) In case of Ht UG cable, before starting the work ensure that the cable is discharged
17) In case of cable loop system, the cable shall be identified with source and destination
18) Ensure that fire extinguishers are in good condition
19) Fire extinguishers shall have marking for the specific class of fires

Safety Practices: Treatment of Electricity Shock:

1) Act at once - delay is Fatal.
2) Death from electric shock is rarely instantaneous.

3) Heart Fibrillations (Heart Muscle Tremors) persist as long as 30 minutes after an Electric Shock. Therefore life can be saved by Immediate Artificial Respiration.
4) Send for but never wait for a Doctor.
5) Continue Artificial Respiration for four hours after apparent death. Release from contact.
6) Switch off current immediately or send someone to do so. Do not attempt to remove a person from contact with high voltage unless suitable articles insulated for the system voltage are used for this purpose. When attempting to force a person from contact with low or medium voltage, use rubber gloves, boots, mat or insulated stick, but if these are not available, use a loop of rope, cap or coat to drag the person free. Whatever is used should be dry and non conducting. After release.
7) Lay the victim on a dry firm surface and remove any foreign material from the mouth. Feel the breathing. If there is no sign of breathing or restlessness start artificial respiration immediately. Do not lose any time, and if possible send for the Doctor and Ambulance. Check that the jaws are lifted and head tilted back so that the mouth and throat are clear. Check the pulse and continue respiration till the pulse is felt. Keep the patient warm and allow him to get the fresh air (Disaster Management, Electrical)

4.1.6 Forest Fire Disasters

Forests have been defined in various ways, however, an ideal definition of forest may be: "Forests constitute the largest, complex & most important natural resource mostly dominated by trees or continuous forest with trees usually growing to more than about seven meters in height & able to produce wood. This includes both closed forest formations where trees of various storey and undergrowth cover a high proportion of the ground and open forest formations with a continuous grass layer in which tree synusia covers at least 10% of the ground. It is also defined as the land with tree crown cover (stand density) of more than 20 percent of its area." Food and Agriculture Organization (FAO) of United Nations defines forest in a bit technical sense as “Land with a tree canopy cover of more than 10 percent and area of more than 0.5 hectare”. In this context the forest is defined not only by the presence of trees but also by the absence of other predominant land uses.

However, this definition of the Forest Fire Disaster Management of the forest does not cover its legal aspect. As far as the legal aspect is concerned, it has nothing to do with tree canopy or the tree cover and is simply defined as an area of land accorded as “Forest” in the revenue

records or proclaimed to be forest under "Forest Law or Act". In India, while describing forest area, only this legal status of the forest is taken into consideration and according to this "forest area" is an area recorded as forest in the government records and is commonly known as "the recoded forest area". The recorded forest area can be classified as reserved, protected and unclassified as defined below

Reserved Forest (RF): An area notified under the provisions of Indian Forest Acts or the State Forest Acts having full degree of protection. In Reserved Forests all activities are prohibited unless permitted.

Protected Forest (PF): An area notified under the provisions of Indian Forest Act or the State Forest Act.

Unclassified Forest (UF): An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forests varies from state to state. In whatever way it is defined; the forests are the major forms of natural landscape and are the most important natural resources of the world. Unlike other natural resources, such as minerals, mineral oils and natural gas, forests have the great advantage of being renewable and its productivity in use depends considerably upon the way its benefits are reaped by man. For million of years most of the parts of the terrestrial habitats i.e. the natural vegetation were forests. For several thousands of years, primitive man lived in forests as hunter and food gatherer component of forest ecosystem. In the later stages, forests were invaded and cleared for suitable agricultural pursuits, this was at such an early stage that man yet did not develop the iron implements and he had to girdle the tree with stone implements. From that stage to the present time, forests are viewed from two angles:

I. Firstly they give valuable raw material and secondly,

II. They are considered rivals for the space needed for crops and flocks.

4.2 BIOLOGICAL DISASTERS

Events in the recent past have shown that the threat of BT is real. 'The arguments advanced to defer consideration of the issues related to bioterrorism have been "without validity" and we cannot delay the development and implementation of strategic plans for coping with civilian bioterrorism'. Reconstructed scenarios in the case of attacks by the more likely BT agents reveal two patterns. In the case of anthrax and botulinum toxin which have high initial effect but no secondary cases, the scenario is similar to chemical attacks. However, when the pathogen used has the ability to set up secondary cases, and probably an epidemic, the scenario is far more complex. The preparation and action have to be tailored appropriately. Bioweapons are particularly attractive to terrorist groups because of the ease of their production and also their low cost. They have been termed 'the poor man's nuclear bomb' since it is estimated that a

large-scale operation, against a civilian population with casualties, may cost about $ 2,000 per sq. km with conventional weapons, $ 800 with nuclear weapons, $ 600 with nerve gas weapons and $ 1 with biological weapons. There have been numerous documented attempts at BT. Biological agents are more efficient in terms of coverage per kilogram of payload than any other weapons system. Terrorism by means of weaponised biological agents such as anthrax is no longer a theoretical concept. Anthrax spores can be milled to an unexpectedly fine degree—100 times smaller than the human strain in size and easily inhaled deep into the lungs. Even the delivery system for weaponised anthrax need not be sophisticated. Accidental release of anthrax bacilli from a bioweapons unit at Sverdlovsk [in the former Union of Soviet Socialist Republics, (USSR)] and an outbreak of salmonellosis in Dallas, Oregon, in 1984 are well known incidents. The postal dissemination of anthrax spores (after 9/11) caused 22 cases, including 5 deaths, and 'ushered in the transition from table top bioterrorism exercises to real world investigation and response'. The crucial role of well trained, alert health care providers like Larry Bush, the infectious diseases physician from Florida, USA, who diagnosed the first case promptly, is underlined by this outbreak.

Forests through Geological Ages

A careful perusal or study of ecosystem is of paramount importance to understand the scientific secrets of the life and its continuity on this living planet, the **EARTH**. Since origin of life in the geological past, diverse ecosystems have evolved on earth, the factors, which are governing climate and are the main geographical dimensions of our planet Earth. Earth is an unique and the only known planet with **LIFE** - the power that an organism possesses to maintain and reproduce itself. The evidences of organic evolution indicate that present forms of life have arisen by gradual changes from pre-existing forms and the more complex forms that have evolved from simpler forms. The distribution of plants and animals in time **(palaeontology)** and space **(geographical distribution)** assumed a great significance. For about 1600 million years ago, when the first simpler form of life evolved on Earth, the vegetation of this planet has passed through a long chain of changes and evolution and the present form of forest on earth is a result of continuous evolution through geological ages.

Forest in India

India is one of the few countries rich in bio diversity. As per the Forest Survey of India Report, 2011, India has forest cover of 692,027 km2, comprising 21.05 percent of the total geographic area of the country. The country shows much variation in its forest vegetation due to its diversified

climatic and physiographic conditions. The forest vegetation in India varies from tropical evergreen forests in the Andaman & Nicobar Islands to dry Alpine forests high up in Himalayas. In between the two extremes, the country has semi-evergreen, Deciduous, Littoral and Swamp, Thorn, Sub-tropical broad-leaved hill pine, and Montana-temperate forests. In physical terms, the forests of the country vary from those that contain trees over 70 meters in height to those that have trees less than 7 meters in height and has stratification of trees that varies from single to many storied. According to Forest survey of India, the country has sixteen types of major forests.

More than ninety five percent forest fires are caused either by negligence or unknowingly by the human being. The rest of the fires are caused by natural reasons i. e. lightning, extreme rise in the temperature etc., which are very rare. In general all over the world the main causes of forest fires are anthropogenic. According to FAO report "Fire Management- Global Assessment 2006", regional estimates of human induced forest fires as follows:

a. Mediterranean- 95%
b. South Asia 90 %
c. South America 85 %
d. North America 80 %
e. Balkan countries 59 %

The natural causes of forest fires are common in remote areas only. Out of three essential components of fire triangle, two components i.e. fuel and oxygen are naturally available in forest. It is the third component i.e. heat that really initiates fire in the forest. Heat may be supplied by either natural or artificial reasons. Depending upon the source of the heat, the causes for forest fire may be classified as natural or artificial. While lightening, volcanic explosion, friction of rolling stone etc. are the natural causes for forest fire; the anthropogenic causes may be subdivided into two categories i.e. deliberate causes and unintentional or accidental causes.

Natural causes, that originate the Forest Fire, can be summarized as follows:

Lightning during thunderstorms may lead to the occurrence of forest fires. Many forest fires start from natural causes such as lightning which set trees on fire. Periodic lightning induced fires have been recorded throughout history from India, Southeastern and Central United States, Australia, Finland and Eastern and Southern Africa (Kaushik, 2004). Natural or prescribed fire sometimes may become a potential hazard to the forest by causing damage to vegetation and wildlife, and releasing huge amount of particulate and gaseous pollutants into the atmosphere

In dry season, friction leading to sparks by rolling stones in the mountainous areas may lead to forest fires. This occurs only when there is considerable combustible material present on the floor. Even small sparks are enough to generate a fire, which may be fanned by strong winds. A devastating forest fire taking lives of four innocent ladies in Gwar village, located 40 km towards north-east from Rudraprayag district of Uttarakhand in February 2001 is an example of such fire. In this region there was no winter rainfall from December, 2000 and thus there was lack of moisture both in the soil and air, resulting in less decomposition of senescent leaves. The dry grass worked as a fuel, fast blowing wind supplied oxygen in plenty resulting in speedy spread of fire and according to the villagers falling of hard quartzite stones produced sparks which ignited the fuel. In bamboo areas, forest fires may occur by the rubbing togetherλ of clumps of dry bamboos. Volcanic eruptions also lead to forest fires naturally.

Adverse impacts of forest fire

Forest fires are a major cause of degradation of forests/ environment. Despite lack of reliable information about forest fire, it is clear that the acreage of forest area burnt today is much more than ever before, all over the world. The area burnt due to forest fires in the United States of America (USA), which was of the order of 1.62 million ha in 2002, has gone up to 4.05 million ha in 2006. It is estimated that in India the proportion of forest areas prone to forest fires annually ranges from 33 percent in some States to over 90 percent in others. Forest fires in about 95 percent cases are anthropogenic and result into wide ranging adverse ecological, economical and social impacts. The Forest Survey of India data on forest fire attribute around 50 percent of the forest areas as fire prone. This does not mean that fires affect country's 50 percent area annually. Very Heavy fire, Heavy fire, Frequent forest fire and Occasional fire damage is noticed only over 0.84 percent, 0.14 percent, 5.16 percent and 43.06 percent of the forest areas, respectively. Only 6.17 percent of the Indian forests are subjected to severe fire damage annually. In absolute terms, out of around 63 million hectares of forests, an area of around 3.73 million hectares can be presumed to be affected by fires annually.

Uncontrolled fires not only burn down the vegetation, but also the surface organic matter, increasing the frequency of flooding and causing soil erosion. In addition, wildlife patterns and habitat are also disrupted by fire. The situation is exacerbated by lack of fire protection planning knowledge and incentive.

A single fire in 1995, in east Kalimantan (Indonesia) burnt over 3 million hectares and caused health problems in adjoining countries too. Impact of

fires on forests even after decades includes diseases, insect attacks, and watershed damages. If one restricts consideration of damage due to forest fires only to loss of lives, then fires do negligible damage and that is why damage due to fires does not get the attention it deserves. Fortunately, the whole world is now concerned about climate change and one of the culprits of climate change is forest fire.

Forest fire management has become important now not only because of loss of timber and other property but also because of the environmental pollution that forest fires cause. The statistics on forest fire damage are very poor in the country. In the absence of proper data, it is difficult to arrive at the accurate losses from the forest fires. Moreover, the losses from fires in respect of changes in biodiversity, carbon sequential capability, soil moisture and nutrient losses etc. cannot be measured exactly, but nevertheless, are very significant from the point of view of ecological stability and environmental conservation. To a certain extent, the loss due to forest fires can be based on the inventories made by the Forest Survey of India as reported in the State of Forest Report, 1995 and subsequent field observations conducted by them. The statistics of losses by forest fires from various states and union territories is still very sketchy and fragmented Much of the data available does not reflect the ground situation and is grossly under reported.

Loss of valuable timber resources

Forest fires cause indispensable loss to timber and deteriorate its quality. Valuable timber species like teak, sal, chir, deodar, sheesam, rosewood etc. are adversely affected by fire. However, the adhesive impact of forest fire varies from species to species, depending upon its susceptibility.

Pine Forest: In Himalayas the periodicity of the fire in pine forest is 2 to 5 years. Eleven percent of the pine forest experiences fire every year. Most of the pine forests experience the surface fire, while some other may experience more damaging crown fire also. The total area affected by a single fire normally limits within a range of 5 sq. km. The fire in pine forest in hilly terrain, moving downward from the hill top is normally slow and less damaging. The fire moving upward from the bottom of the hills is more damaging and usually turns into crown fire and is very difficult to control.

Teak Plantations: Teak is vulnerable to damage from low intensity fires only for its first five years, thereafter low intensity fire has no effect on the tree or on wood quality. From about five years onward, the dense canopy of teak during the growing season suppresses most under storey weeds.

Eucalyptus Plantations: The eucalyptus, although a smooth barked variety, once they are older than about 5 years, are quite tolerant of low intensity ground fires. They can be control burnt from age five onwards safely. Fires after that age do not cause any noticeable loss of timber quality for pulpwood. Therefore, it is only during the period 2-5 years that they are vulnerable to fire and need protection measures.

Mahua: It is likely that forest fires have very little impact on mahua trees. This species occurs as scattered single trees in mixed species stands. It is understood that virtually every tree is visited each year for the mahua harvest. The practice of burning under the trees to clear the undergrowth in preparation for harvest means that each tree has its own fire trace created for it. Even if subsequent leaf fall occurs, the litter is very light and does not carry a damaging fire.

Impact of forest fire on eco- system

The most damaging impact of forest fire on ecosystem is very evident in the Himalayas, where hills existing between the heights of 1000 to 1800 meters are dominated by pine forests and seem to be more fire prone. Most of these forests have preceding fire history; repeated fires have converted mixed forests of oak and chir to pure chir forest. Of course, chir pine was also planted in these areas but one of the principal reasons for the conversion of mixed forests of oak and chir is the occurrence of repeated and uncontrolled fires. Uncontrolled fires have made the situation less favourable for oaks to grow and more favourable for chir to grow. The uncontrolled fires in such areas help in spreading pine forest at the cost of indigenous oak forest, which is very serious threat to the ecological balance in the Himalayan region.

Degradation of water catchments areas resulting into loss of water

After forest fire, soil moisture is decreased and litter decomposition becomes almost negligible, which creates a possibility of forest fire in future. Just after fire, the chemical and physical changes in upper layer of soil make it impervious and thus reduce water infiltration. The removal of litter also decreases water holding capacity of soil and most of the rainwater is washed away removing top fertile soil of the forest resulting into loss of soil fertility.

Loss of wildlife habitat and depletion of wildlife: Forests are the habitat of many wild animals. Sometimes the local people put the fire and drum beats to keep the wild animals away, but when fire becomes uncontrolled, the problem of survival of animals and their habitat arises. Wildfire along with killing wild animals also destroys their habitat and thus makes their survival at stake. The forest fires in Sankhuwasabha and Ilam in Nepal

claimed red pandas, leopards as well as monkeys, deer, bear and other species.

Forest fire dramatically impacts the animal life. Animals are first to lose their lives due to heat generated. Eggs of birds and insects are destroyed due to fire impact. Some animals have a natural threat warning system and usually migrate from the danger areas. The birds also save themselves by migration, but their eggs are usually destroyed. Such migration of birds and the animals in normal condition is not permanent and they return back when the conditions are normalized.

Loss of natural vegetation and reduction of forest cover

As a result of fires, millions of hectares of the forest area turn to ashes and remains of no use. Among various degradation factors, forest fire is also one of the major factors for overall loss in forest cover. The wild fires have adverse impact on forest tree growth. Researches in United States have shown that today many low elevations forest in the west are thick with small trees, while historic photographs and personal accounts tell of these forests characterized by large trees spaced far enough.

Global warming

One of the major culprits of climate change is forest fire. The immediate effect of vegetation burning is the production and release of gases including carbon dioxide, carbon monoxide, methane, non-methane hydrocarbons, nitric oxide, methyl chloride and various other gases, which are released and returned to the atmosphere in a matter of hours. The burning of forest also destroys an important sink for atmospheric carbon dioxide. Hence, burning has a significant role in the world's carbon dioxide budget. If the burned ecosystem regrows, the carbon dioxide is eventually removed from the atmosphere via photosynthesis and is incorporated into the new vegetative growth. Other gaseous emission, however, remain in the atmosphere. The depletion of ozone layer gets started as a result of these noxious gases. This ozone layer depletion not only results in various adverse impacts but also further increases the chances of forest fire in future. International Centre for Integrated Mountain Development (ICIMOD) working in Hindukush Mountains pins the blame on global warming for creating the conditions that led to fires. Some foresters blame record high temperatures and the failure of winter rains for destruction through fire of hundreds of hectares of natural forest in the Garhwal Himalayas in India and in eastern and central regions of Nepal in 2006. Green house gases released during the combustion of vegetations lead to an increased warming of the earth or human induced global climate change. Studies suggest that biomass burning has increased on a global scale over

the last 100 years and calculations indicate that hotter earth resulted from global warming will lead to more frequent water related calamities and larger fires.

As per FAO report "Fire Management- Global Assessment 2006", the quantity of biomass burned each year from all resources is about 9200 million tones. Overall global fires in vegetation consume 5130 million tones, 42 percent of which is in Africa. This burning releases about 3431 million tones of CO2 and other emissions. However due to cyclic nature of disturbances in fire dependant and fire dependant eco systems involves sequestration of atmospheric carbon for regrowth of the plant biomass and thus fire generated CO2 is not contributing to a net release of carbon in atmosphere.

Microclimate change: The changed microclimate caused by removal of litter and duff, opening of the canopy by killing over storey shrubs and trees and darkening of the soil surface by residual soot and charcoal can increase insulation causing temperature increase. As a result the changed area becomes unhealthy for living of both wild habitats and local people.

Soil erosion: The scientific studies indicate that erosion of the soil from the forest land depends on many factors i.e. the soil porosity, its mineral composition, the texture, the gradient of the land and length etc. All these factors decide the ease with which the individual soil particles are detached. Though the erosion of soil during low scale forest fire is a natural phenomenon, yet during severe fire conditions, this process turns into more serious problems, both for environment and habitat. Anthropogenic activities such as fire suppression, logging and road construction in forest areas have adversely affected the soil stability. The fire impact on forest floor may vary from just removing the litter to the total consumption of the forest fuel and alteration of the soil mineral structure.

The most intense forest fire always has a direct heating effect on the soil at the depth below 7 to 10 cm. As a result, the soil of the fire affected area loses its water holding capacity and becomes vulnerable for erosion. Due to consumption of the forest organic residue by fires, the mineral soil is exposed and consequently its infiltration and water holding capacity are automatically reduced. Burning of vegetation also reduces the amount of rain fall infiltration by the forest canopy and reduces evaporation by the forest vegetation.

The soil and water response to wild fire is often a function of fire severity and occurrence of hydrologic events. For a wide range of severities, the impact of hydrology and sediment loss can be minimized if the precipitation is less. However, when the precipitation follows a severe fire,

the impact of the water is very high and substantial. This increase in soil erosion, especially in the hilly terrain has very long lasting impact on the ecosystem of the region. The duration of the increased vulnerability also depends upon the severity of the forest fire.

In moderate fire conditions, the normalcy in soil erosion may return back within a year or two. However, in the case of very severe fire conditions, the return period to normalcy may vary from 5-7 and even ten years

In hilly terrains, the rate of the soil erosion shows spatial variability, which is an important characteristic of hill slopes. Field experiments show that when two third of the upper portion of the hill slopes is in high severity burn conditions, it produces twice as much sediment as compared to when the upper two- third lies in low severity burn conditions. The earlier conditions are very common in field and thus lead to severe soil erosion.

Soil erosion and impact on ecosystems- The fire initiated soil erosion has very adverse impact on various eco- systems near the burned area. Loss of soil from hill slopes produces several significant ecosystem impacts. Soil movement in the streams, lakes etc. may degrade water quality and change the geomorphic and hydrologic characteristics of these systems. The soil loss from hill slopes may also alter future soil productivity. As a result of the increased soil erosion, the delivery of the sediment in large quantities to water bodies may also affect aquatic animals and their habitat.

Forest fire and floods

The water yield of a water body depends on the quantity of the rain, evapotranspiration, type of the soil and vegetation etc. During the first year after a fire, the magnitude of the total water yield suddenly increases. The magnitude may vary greatly within a location or between locations, depending upon the fire intensity, rainfall, geomorphology, the type of soil & vegetation and the proportion of the vegetation burned. In some exceptional conditions this may lead to flood also. Water repellent soils and cover loss cause flood peaks to arrive faster, rise to higher levels and entrain significant amount of bed load and suspended sediments. These floods may have devastating impacts on soil and water quality and also affect the ecosystem prevailing in the region.

Deteriorating Biological Environment- Forest fires also pose serious health hazard by creating polluting smoke and noxious gases. The burning of vegetation gives off not only carbon dioxide but also many other noxious gases (Green House gases) such as carbon monoxide, methane hydrocarbons, nitric oxide and nitrous oxide that lead to global warming

and ozone layer depletion. Thousands of people suffer from serious respiratory problems due to these toxic gases.

Burning forests and grasslands also add to already serious threat of global warming. Forests play a vital role in keeping the level of carbon di oxide in the atmosphere in check. Forests, grasslands and agricultural lands make up bulk of the global biomass burning in a global phenomenon. Recent research suggests that biomass burning may be a significant global source of methyl bromide, which is an active ozone depleting substance. Researchers have also come out with very significant information about the impact of forest fire on environment as a result of green house gas- nitrous oxide through bacteria. Nitrification is a biological process where bacteria convert ammonia (found naturally in soil and fire ash) to nitric oxide and nitrous oxides. The increased concentration of ammonia in the ash leads to more nitrification after a fire, thereby releasing additional nitric and nitrous oxide.

Adverse impact on Health system- The fires in the forest are source of smoke that cause air pollution and rise in the temperature. The forest fires in 1995 and 1999 in Himalayan states gutted the mountains with the smoke, resulting into loss of visibility to about 200 meters. The temperature in the region also rose by 2 to 3 degree Celsius. This resulted into uneasiness among the local population of the region. Scientific studies of major forest fire of South East Asia of 1997 came out with many new findings. These fires were unique, since they involved both the burning of above ground vegetation, as well as the below ground i.e. peat (a form of coal). Smoldering peat vegetation produces much more smoke than the burning of normal vegetation. This fire generated smoke covered almost all of South East Asia resulting into more than 20 million cases of smoke related health problems.

Socio-economic impact- Fire is a major factor of destruction of human settlelement and often causes deterioration of site by subsequent increased erosion. Thus fire is threatening human life and property both. If the weather conditions are very dry or windy, fire burns much faster. A fire near settlements may also damage the houses. Damage also can be caused by smoke. Smoke in building smells unpleasant, leaves ashes and impacts human health. Forest fire also adversely affect livelihood resources, especially for tribals, who habitat within or near the forest. In India, where approximately 65 million people are classified as tribal and directly depend upon collection of non-timber forest products from the forest areas for their livelihood are directly affected by forest fire.

Carbon sequestration potential

Trees act as carbon sinks when they absorb carbon dioxide from atmosphere and build up the same in the form of wood. Hardwood contains 48 percent of carbon in the form of cellulose and wood and it is estimated that 2.2 tones of wood are required to sequester one ton of carbon. On the other hand, while the wood is burnt the reverse process takes place in which the atmospheric oxygen is used and carbon- di-oxide is released into the atmosphere. Hence, forests act both as source as well as sink of carbon, depending upon the manner and purpose for which they are raised and managed. Burning of the vegetation release hundreds of years of stored carbon dioxide (CO2) into the atmosphere, and thus results into permanent destruction of important sink of carbon dioxide.

Threat to Life and Property- Forest fires affect human life and property in different ways. Human life is at risk when fire crews fight fires either at the fire front or from conflict with animals, especially elephants. A forest fire that spreads outside the forest can consume buildings or infrastructure. There are also indirect dangers to life and property due to forest fire. If too much forage is lost within the reserve, elephants move out of the forest searching for food and in doing so destroy crops and property. In certain cases forest fire directly cause loss of life as observed in Gwar village of Rudraprayag district in the year 2001, when four ladies were killed while harvesting grass near forest area. In hills, the management practices of forest fire are interrupted by various types of constraints such as poor knowledge & data base, lack of cooperation among sectors, resources, training of staff and paucity of funds etc.

In the western countries, especially in the United States, forest fires cause enormous loss to house buildings. As per an estimate, forest fires burned around 10,000 houses in the United States between 1985 and 2000. In 2000 alone, at least 800 family houses were destroyed by wild fires in that country.

Reducing Tourism Values

Smoke and haze generated by fires are inimical to a good tourist experience, especially when a significant part of the tourist experience depends on views of the mountains. Fire in forest gives a negative impression to the tourists. Smoke due to fires affects the visibility and air quality which adversely affect tourism industry. From the overall tourism industry perspective, the generation of smoke needs to be minimized, especially during the peak tourist season of April-June.

(FOREST FIRE DISASTER MANAGEMENT)

1.10 IMPACT OF BIOLOGICAL DISASTERS

Dispersal experiments have been attempted using non-pathogenic Bacillus globigii, which has physical characteristics similar to Bacillus anthracis. The variables in dissemination have been worked out and the impact of bioterrorist attacks estimated. The dispersal experiments showed that an attack on the New York subway system would k kill at least 10,000 people. WHO studies show that a 50 kg dispersal on a population of 500,000 would result in up to 95,000 fatalities and over 125,000 people being incapacitated. Other experiments have also shown similar disastrous outcomes. 9 In the case of smallpox, the emergence of secondary cases at the rate of 10 times the number of primarily infected subjects, would add to the burden. There would also be a demand for large scale vaccination from meagre stocks and no ongoing production. Inevitably, epidemics would break out and social chaos would ensue. The economic impact of BT would be a major burden that could transcend the medical consequences. It has been estimated that the use of a lethal agent like Bacillus anthracis would cause losses of $26.2 billion per 100,000 persons exposed, while a less lethal pathogen, e.g., Brucella suis would cause $477.7 million. The study also shows that a post-attack prophylaxis programme will be cost-effective, thereby justifying expenditure on preparedness measures. The major economic losses that occurred due to the fallout of the 1994 Surat plague epidemic of natural origin is an example of the larger ramifications of BT/ BW. A BT attack on agriculture can cause as much economic loss as an attack on human beings. The spread of the Parthenium hysterophorus weed, which entered India in the late 1950s along with imported wheat, affected the yield of fodder crops and became a crop pest. This is an excellent case study on how an inadvertent entry of exotic pests can occur and lead to adverse consequences in the long term. With properly equipped emergency crews, designated meteorological experts to track the movement of airborne particles, stockpiling of prophylactic and therapeutic antibiotics, and a mechanism for going rapidly to emergency mode, the estimated casualties can be reduced to just 5–10% of the normal casualty rates. This analysis succinctly expresses the need for, and value of, a proper response to BT.

Biological Disasters: Epidemics

Definition and characteristics

An epidemic is then unusual increase in the number of cases of an infectious disease which already exists in a certain region or population. It can also refer to the appearance of a significant number of cases of an

infectious disease in a region or population that is usually free from that disease.

Epidemics may be the consequence of disasters of another kind, such as tropical storms, floods, earthquakes, droughts, etc. Epidemics may also attack animals, causing local economic disasters.

In general, the Red Cross Red Crescent response to epidemics prioritizes creating awareness, advocating effective action, social mobilization based on volunteer activities and logistics support (transport, warehouses, etc). Federation support often complements the efforts of UN bodies.

Avian flu

Avian influenza (AI) is a viral infection primarily affecting birds (chickens, ducks, geese etc., both domestic and migratory species), but also sometimes other species such as pigs and tigers.

Rarely, bird flu can cause severe infections in humans. There are many different strains or varieties of AI viruses. They are a sub-group of influenza viruses, which includes the flu virus that causes seasonal outbreaks in humans around the world every year.

Cholera

Cholera is mainly spread by drinking water contaminated by faeces. The fatality rate for severe, untreated cases is 50 per cent; when treated this drops to one per cent.

The incubation period is 1-12 days and severe cases need hospitalisation. Less severe cases can be treated with rehydration therapy on an outpatient basis. Only 10 per cent of those infected present symptoms.

Key control factors are: ensuring a safe water supply and rigorous hygiene (hand washing and disposal of soiled items).

Crowded wards are not a hazard to staff or visitors, if good hygiene is observed. Quarantine is unnecessary. Vaccine is inappropriate in an emergency.

Dengue fever

Dengue or breakbone fever and dengue haemorrhagic fever are transmitted by "day biter" mosquitoes. Dengue fever is rarely fatal; the haemorrhagic variety, if untreated, can result in a 40-50 per cent mortality rate. With hospital care and fluid therapy, this can be brought to below five per cent.

No vaccine or specific treatment is available. Epidemic control measures comprise mosquito destruction and elimination of breeding sites and the use of mosquito repellents by exposed persons.

Ebola and Marburg

Two distinct viral diseases with similar symptoms. Both have a high fatality rate (up to 90 per cent for Ebola) and are extremely contagious - transmission is through contact with all body fluids and organs, use of contaminated needles and syringes, and the aerosol route.

Extraordinary precautions should be taken to prevent contamination of all those involved in assisting patients. The reservoir of the two viruses is unknown.

Malaria

Malaria is transmitted by the bite of the anopheles mosquito, a dusk to dawn biter.

Where the disease is endemic, the local population has some degree of immunity. The people at greatest risk are those from a non-malarial area, such as IDPs or refugees. They can be protected by a weekly dose of a malaria suppressive drug. Of the four types of malaria, falciparum can be rapidly fatal and needs prompt treatment.

Treatment is by orally administered drugs. Control measures include the spraying, filling or draining of standing water where mosquitos breed, the spraying of living and sleeping quarters and the use of bednets. Quarantine is unnecessary, as is the immunisation of contacts. An immunisation coverage of less than 90 per cent means a major risk of outbreaks.

Measles

This is a highly communicable viral infection that can result in a very high mortality rate, especially among children and undernourished populations.

A prompt and comprehensive vaccination programme at the start of an outbreak can help limit its spread. If vaccine supplies are limited, the first priority is malnourished and hospitalized children, the next priority six-month to two-year-old children. A reliable cold chain is essential for vaccine storage. Isolation or quarantine is impractical.

Meningococcal Meningitis

Meningococcal Meningitis is an acute bacterial disease. Epidemic waves occur at irregular, unexplained intervals. Chiefly affects children and young adults, especially those in crowded living conditions.

The disease is transmitted by direct contact with nose and throat discharges. Infected individuals should be separated from others and their immediate contacts put under close health surveillance.

Rapid treatment, with penicillin or ampicillin, is essential. Emergency immunization campaigns are reasonably effective.

Yellow fever

Yellow fever is a deadly and fast-spreading mosquito-borne virus occurring only in parts of Africa and South America. The disease is highly communicable.

Action to control an epidemic should include mass vaccination of people at risk; screening and spraying of patients' rooms or hospital wards to prevent mosquito access; elimination or use of larvicide on all existing or potential mosquito breeding sites; spraying with insecticide of all houses in the community. Vaccination provides a ten-year immunity.

HIV/AIDS

HIV/AIDS (Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome) will kill more people this decade that all the wars and disasters in the past 50 years. Since the AIDS epidemic began, 25 million people have died and more than 40 million are now living with HIV and AIDS. In 2001 alone, five million people became infected worldwide.

Epidemic diseases are not new but what sets HIV/AIDS apart is its unprecedented negative impact on the social and economic development of nations. Everyone, rich or poor, young or old, is affected by the HIV/AIDS epidemic but people in developing countries, particularly young women, are the most vulnerable. The majority of the victims are adults in the prime of their working and parenting lives. Their legacy is a decimated workforce, fractured and impoverished communities, and millions of orphans.

While 70 per cent of HIV-infected people live in sub-Saharan Africa, AIDS is a global problem. In countries like Zimbabwe and Botswana, over 25 per cent of people between the ages of 15-49 are infected with the virus. HIV infection is also spreading rapidly in south and south-east Asia, the countries of the former Soviet Union and the Caribbean.

AIDS can be prevented. The fight against the disease must be waged at the local level. Individuals and communities can cope with the spread of HIV/AIDS by being properly informed, assessing accurately the factors that put them at risk of infection and by subsequently acting to reduce those risks. The problem, according to the World Bank, is that there has not been sufficient amount of coordinated activities to slow and eventually reverse the spread of the disease. Individuals, governments, civil society, private sector groups, international and non-governmental organizations must fully commit and participate in scaling up response ensuring that complementary initiatives occur at the national and regional level.

Tuberculosis

Tuberculosis (TB) is the single most deadly infectious disease and kills two million people each year. Of the eight million new cases annually, 95 per cent are in developing countries. Asia and sub-Saharan Africa are the hardest hit, but Eastern Europe has recently seen a major increase in the incidence and deaths related to TB after many years of steady decline. An

estimated 75 per cent of people with TB are between the ages of 15-44, which is seriously damaging socio-economic development.

In 1993, the World Health Organisation (WHO) launched the Stop TB initiative in response to the growing crisis. Since 1998, the International Federation of Red Cross and Red Crescent Societies has been working closely with National Societies and the WHO to control the TB epidemic in Eastern Europe. These efforts were initially intended to serve as pilot projects to gain experience and to provide assistance to patients and their families. Such programmes have shown that there is an urgent need to scale up activities in order to have a greater impact on the epidemic worldwide. (IFRC)

Pests Attacks

Pests and diseases are part of the natural environmental system. In this system there is a balance between predators and pests. This is nature's way of controlling populations. The creatures that we call pests and the organisms that cause disease only become 'pest and diseases' when their activities start to damage crops and affect yields. If the natural environmental system is imbalanced then one population can become dominant because it is not being preyed upon. The aim of natural control is to restore a balance between pest and predator and to keep pests and diseases down to an acceptable level. The aim is not to eradicate them altogether, as they also have a role to play in the natural system. Once a pest or disease has started to attack a crop, the damage cannot be repaired and control becomes increasingly difficult. Where possible, use techniques to avoid or prevent pest and disease attack in the first place.

Methods of Pest and Disease Control

• A healthy soil	Plants to attract predators and parasites
• A healthy crop	Barriers
• Resistant varieties	Traps
• Rotation	Light traps
• Good hygiene	Fly traps
• Soil tillage	Hand picking
• Soil pH	Biological control
• Timely sowing	Natural pesticides
• Companion planting	Social prevention

Pesticides do not solve the pest problem. In the past 50 years, insecticide use has increased tenfold, while crop losses from pest damage have doubled. Here are three important reasons why natural control is preferable to pesticide use.

Cost

Using natural pest and disease control is often cheaper than applying chemical pesticides because natural methods do not require buying expensive materials from the outside. Products and materials which are already in the home and around the farm are most often used.

Safety for people

There is much concern over the dangers of chemical products. They may be misused because the instructions are not written in the language spoken by the person using the product. There have been many reports of people suffering from severe skin rashes and headaches as a result of using chemical pesticides. There are an estimated one million cases of poisoning by pesticides each year around the world. Up to 20,000 of these result in death. Most of the deaths occur in developing countries where chemical pesticides, which are banned in Europe or the USA, are still available.

Safety for the environment

Pests are often controlled with man made chemicals which have many harmful effects, for example:

• Artificial chemicals kill useful insects which eat pests.

• Artificial chemicals can stay in the environment and in the bodies of animals causing problems for many years.

• Artificial products are very simple chemicals and insect pests can very quickly, over a few breeding cycles, become resistant to them and can no longer be controlled.

(TNAU - Natural Pest and Disease Control)

Current Issues

After a series of farmer suicides in Odisha's Bargarh district over pest attack, the state government finally acknowledged that there are nearly 200,000 hectares of area, on which paddy is grown, has been damaged across nine districts.

According to farmers, spurious pesticides were in use which proved ineffective to control Brown Plant Hopper, which first wilted lush green crops and then turned them into rust. To prevent further spread of the pest, farmers burnt their crops, but it was not effective.

The state government is yet to take call on whether to send samples of pesticides to lab for testing. No one in the government is ready to talk about spurious pesticides.

"Hybrid paddy, high density plantation, high-urea and ammonium content in fertilisers, more pesticide usage and favourable environment aggravated brown plant hopper incidence," says GV Ramanjaneyulu of Center for Sustainable Agriculture, a Hyderabad based non-profit.

The incident of Odisha came close on heels of similar incidents of Yavatmal district of Maharashtra's Vidarbha region. Nearly 30 farmers died of inhalation of spurious pesticides while spraying on cotton.

As the pesticide proved ineffective in controlling pests in cotton plants, the farmers resorted to indiscriminate spraying of the pesticide.

There are reports of increasing pest attack on paddy crops in Lakhimpur district of Assam and cotton crops in Telangana, Andhra Pradesh.

In Telangana and Andhra Pradesh, huge pink bollworm attacks are now rampant despite spraying of pesticides.

There are also reports of growing of Ht cotton (Herbicides tolerant cotton, a variety of GM cotton), which is illegal

"The Ht Cotton has not yet been approved by government but its seeds were being sold to farmers and they are growing it," says Ramanjaneyulu, also an agriculture scientist.

"For several years, Vidarbha region of Maharashtra, Telangana, Andhra Pradesh and Gujarat have seen high pest incidences and pockets of resistance to pesticides," he adds.

The pink bollworm had already developed resistance to Bollgard I in 2009. Bollgard is a technology to provide in-seed protection to cotton crops. In 2015, in Gujarat and some parts of Telangana, Andhra Pradesh and Maharashtra, Bollgard II cotton was also damaged. In 2015–16, there were crop losses due to whitefly infestations in Punjab and Haryana.

In Assam, the main pest is *Spodoptera mauritia*, also called paddy swarming caterpillar or the lawn armyworm. It affected more than 500 hectares (ha) of area in one district.

The union government, this March, asked West Bengal government to declare wheat crop holidays for three years in Nadia and Murshidabad districts to avoid the spread of wheat blast disease in these districts.

Recently, there has been an outbreak of wheat blast diseases in Bangladesh, which shares border with West Bengal.

It will affect 120,000 ha of wheat area. In Murshidabad, around 80,000 ha, and in Nadia, about 40,000 ha of wheat-cultivated area have been affected.

In place of wheat, government is encouraging alternative crops so that farmers are not affected.

"We are encouraging pulses, lentils, mustard, and also proposed 200 pulses mills for processing it," says Pradeep Majumdar, agriculture advisor to chief minister of West Bengal.

"For setting up of each mill we have proposed to provide 50 per cent loan, which go up to Rs 400,000," says Ashish Banerjee, state agriculture minister.

Besides spurious pesticides, these pest attacks are also result of rising temperature in the wake of climate change.

Cuttack-based National Rice Research Institute (NRRI) scientist attributed these pest attacks to rise in temperature and humidity that creates condition where female moths lay eggs at faster rate.

“If there is delay in spraying pesticides it becomes difficult to control,” says Mayabini Jena, a principal scientist and head of Crop Protection division at the NRRI told media.

(Jitendra, Tuesday 07 November 2017)

4. Food Poisoning

The term Food Poisoning covers a wide range of conditions, from minor illnesses through to life-threatening or fatal infections. Generally speaking, these conditions are caused by ingesting foodstuffs that contain or have been contaminated with a harmful bacteria or virus.

For most of us, a bout of food poisoning will result in at most a couple of days of discomfort, with relatively minor symptoms such as nausea, vomiting, diarrhoea and stomach cramps. Usually this does not require medical intervention, and recovery requires only a period of rest with careful attention to diet.

In some cases however, the symptoms can be much more severe, leading to serious dehydration, fever and in certain cases even proving fatal. As many illnesses, certain groups such as the very young or elderly are at risk of more serious effects, as well as individuals lacking access to basic first aid, clean water or proper sanitation.

In the developed world, the incidence of severe cases of food poisoning has been significantly reduced due to better preservation, storage and handling of food, increased public awareness about the risks, and improved sanitation, however in less economically developed countries, or during wars or natural disasters, the problem is often widespread.

Food Poisoning Statistics Developed countries report very low levels of serious illness or death due to food poisoning, with annual deaths per 100,000 inhabitants reported as 1 in the US, 0.8 in the UK, 0.75 in France and 0.5 in Australia, and annual hospitalisations as 43, 28, 182 and 87 respectively.

A 2015 study by the World Health organisation estimates that 10% of people worldwide will fall ill with a foodborne disease each year, leading to 420,000 deaths – 7 to 10 times higher than in the countries mentioned

above. The highest number of deaths are reported in the poorest regions, 175,000 in SE Asia and 137,000 in Africa.

Outbreaks & Common Causes

Outbreaks of serious food poisoning can often spread quickly within populations, due to contaminated water sources, poorly prepared or stored food, contact with infected animals or spread from person to person due to poor personal hygiene or lack of access to sanitation. Some of the more common contaminants and types of food poisoning are listed below:

Escherichia coli (E. coli)

E. coli is commonly present in human intestines, but certain strains of the bacteria can be a cause of food poisoning. In most cases E. coli causes diarrhoea, abdominal pain, and fever which subside within a few days. In sever cases though, the infection can lead to can lead to severe dehydration, bloody stools and even kidney failure.

Salmonella

Salmonella is often found in dairy products, eggs and poultry which has been improperly cooked, and produces classic food poisoning symptoms in its mildest form. However, severe infections can spread from the digestive tract to the bloodstream, and some forms of the bacteria can even cause typhoid fever.

Campylobacter

Campylobacter is one of the most commonly found contaminants in the UK, causing symptoms a few days after ingestion and lasting from two days to a week. The bacteria is usually found in contaminated water or raw or undercooked poultry.

Listeria

Listeria bacteria often contaminate unpasteurised cheeses, poultry, meat, fish and raw fruit and vegetables, and can also be found in soil. While symptoms are usually mild and disappear within a few days, severe cases can exhibit a fatality rate of up to 25%.

Shigella

Shigella is closely related to Salmonella, and is one of the leading global causes of dysentery resulting in between 100,000 and 600,000 deaths per

year, principally in Africa and South East Asia. In rare cases it can also cause seizures in young children and reactive arthritis in adults.

Norovirus

Also known as the 'winter vomiting bug', Norovirus is usually transmitted by person to person contact, or fecal contamination of food or water. While most cases result in minor illness for two to three days, as with all foodborne illness, the effects are often more severe in vulnerable individuals.

Rotavirus

Most illness caused by Rotavirus occurs in children, as immunity to the virus develops relatively quickly. It is generally less severe in developed countries, presenting as a mild fever with vomiting and diarrhoea, particularly where vaccination programmes are in place. Globally however it is responsible for 37% of all child deaths from diarrhoea and is highly contagious.

Parasites As well as bacteria and viruses, parasites can also cause food poisoning, usually due to toxins excreted into the body of the host. While rare in the developed world, parasitic infections such as cryptosporidiosis, giardiasis and ameobiasis, or ameobic dysentery are common in the developing world.

Prevention and Treatment

Reducing or preventing food poisoning requires a high standard of both personal and food hygiene, and as has been mentioned above, the challenges to prevention increase in regions with less reliable sanitation, health infrastructure and public education programmes.

One key area is food storage, handling and preparation. Maintaining strict standards of hygiene in the butchering and transport of meat and the washing and storage of fruits and vegetables can eliminate many harmful contaminants.

Chilling, freezing or preserving food helps to eliminate bacterial growth, and careful separation of raw and cooked foods is necessary to reduce cross contamination. Use by dates are important in helping to identify food which may have become contaminated, even if this is not immediately apparent by its appearance or odour.

Regular hand washing and cleaning of kitchen implements and surfaces is also an important factor in preventing the spread of foodborne illness, as

well as ensuring that people exhibiting symptoms of food poisoning do not prepare or handle food.

On a wider level, the provision of clean water supplies and properly managed sewage and sanitation facilities is crucial to preventing large outbreaks of illness, as well as regulation of food hygiene standards and proper packaging and labelling.

Vaccination has also been used in some cases to prevent the spread of particular food borne illnesses, particularly rotavirus, although many of the pathogens which cause food poisoning adapt over time, and can render vaccines ineffective eventually.

This ability of viruses and bacteria to evolve resistance also means that health authorities are reluctant to treat food poisoning with antibiotics, especially when symptoms are relatively minor.Overall, as the saying goes "prevention is better than the cure" – and organisations such as the WHO devote much of their time to public education programmes aimed at assisting people all over the world to identify and avoid the risks associated with these types of illness. (Health A To Z)

Check your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What are the three main reasons for the instability for the boast capsize?

ii. What are the reasons for accidental contact with live electric wire / equipment?

iii. Define 'Forest'?

iv. Expand a) FAO b) RF c) PF

v. What are the gases that cause global warming?

4.3 LET US SUM UP

This chapter highlights on our Indian Railways, which is one of the largest railway systems in the world and is fully owned and operated by Ministry of Railways, Government of India. It plays a significant role in driving

economic growth of the country, offering highly affordable, environment-friendly transportation to passengers and freight, especially bulk commodities, across the country. Then comes the Waterways – Boat Capsize. Boats are inherently stable until something causes them to become unstable. And that something is weight — where it is and how much it is determines when a boat will tip over far enough to capsize or fill with water. It also covers the Major Building Collapse, Festival Related Disasters, Electrical Disasters, Forest Fires and Biological Related disaster in this chapter.

4.4 UNIT END EXERCISE

1. What are the causes and impact of railway accident?
2. Explain the common construction faults.
3. List down the Indian Electricity Rules and regulations.
4. Discuss about the natural causes for forest fire.
5. What is global warming? Suggest few ways to combat it.
6. Explain biological related disaster in brief.

4.5 ANSWER TO CHECK YOUR PROGRESS

i. Three main reasons for that instability: too much or unbalanced crew or equipment weight; leaking water, which also creates too much weight; and bad weather, which causes instability as a boat is rocked and filled with water.

ii. Reasons for accidental contact with live electric wire / equipment: a) Operating staff not properly skilled / trained. b) Similarly, the work is not being supervised by qualified personnel, c) Error in isolation of supply. d) Inadequate ground clearance / operational clearance of the live parts. e) Ignorance about the discharging line / equipment before starting of maintenance work / repair works.

iii. "Forests constitute the largest, complex & most important natural resource mostly dominated by trees or continuous forest with trees usually growing to more than about seven meters in height & able to produce wood.

iv. a) FAO - Food and Agriculture Organization b) RF - Reserved Forest c) PF - Protected Forest

v. Carbon dioxide, carbon monoxide, methane, non-methane hydrocarbons, nitric oxide, methyl chloride etc.

4.6 SUGGESSTED READINGS

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UNIT V - PHASES OF DISASTERS

Structure

5.1 RESCUE & RELIEF PHASE

Relief refers to the provision of essential, appropriate and timely humanitarian assistance to those affected by a disaster, based on an initial rapid assessment of needs and designed to contribute effectively and speedily to their early recovery. It consists of the delivery of a specific quantity and quality of goods to a quantified group of beneficiaries, according to selection criteria that identify actual needs and the groups that are least able to provide them for themselves.

Relief can be sub-divided into three categories

Food: Food supplies are frequently part of the Red Cross/Red Crescent response to emergencies. However, it is essential in each situation to first establish that food supply is a correct response and then that the composition is defined and described after an adequate comprehensive survey. In every instance it is necessary to ensure that food donations are culturally and nutritionally appropriate for the affected population and that the costs of their purchase, transportation, storage and distribution is kept to a minimum.

Food assistance will not be needed where disasters have no major effect on food stocks or crops, or where the effect is very localised, and when people are able to draw on their own savings or food reserves. There are three main types of food assistance for the most common situations:

Short-term assistance. The need for short-term food relief, rapidly followed by rehabilitation and development activities, is typical of many “sudden” disasters, including floods, earthquakes, high winds, fires, pest attacks, short-term civil disturbances etc. Food stocks can be destroyed, normal food supply and marketing systems disrupted, and crops damaged or lost.

The aid might be required for only a few days – which is the case with many earthquakes – or up to the next harvest, when subsistence farmers and agricultural labourers have totally lost food stocks and crops;

Deferred assistance. Assistance deferred – until just before the next harvest, for example – will be the case following events which have damaged but not totally destroyed crops or food stocks, as in many floods, storms and localised droughts;

Long-term assistance. Here, assistance is provided over a long period and combines both relief and self-reliance development activities. Over time, the balance shifts progressively away from relief. This type of assistance applies to emergencies due to successive crop failures and most situations involving refugees or displaced people.

The balance between relief and more productive applications of food assistance, and the rate at which the balance can be shifted towards the latter, depends on many factors. These include the initial health and nutritional condition of the people, the possibilities for growing food or engaging in other income generating activities, government policies, security situation etc.

Shelter: Shelter is a critical determinant for survival in the initial stages of a disaster. Beyond survival, shelter is necessary for security and personal safety, protection from the elements and resistance to ill health and disease. Shelter assistance is provided to individual households for the repair or construction of dwellings or the settlement of displaced households within existing accommodation or communities. When it is not possible to provide individual shelter, collective shelter is provided in suitable large public buildings or structures, such as warehouses, halls or barracks, or in temporary planned or self-settled camps.

Non-food items: When people have lost everything in a disaster, they require basic and culturally appropriate goods and supplies to maintain their health, privacy and dignity, to meet their personal hygiene needs, to prepare and eat food and to achieve necessary levels of thermal comfort. These might include clothing, blankets, bedding, stoves and kitchen sets, water containers and hygiene products.

5.2 RESCUE AND RELIEF PROVISIONS BY ARMY

The primary role of the army is to defend the sovereignty and integrity of our country. Its organization, training and equipment are tailored to meet

this. It would not be practicable to change the basic structure in order to handle an additional task such as disaster management. Disaster Management as we know is a highly specialized subject. As we have earlier seen in the case studies, there are instances when the equipment available with the army is not really suitable for disaster relief. However at the same time one should also view the overall picture as to whether our country can really afford a separate agency to look after disaster management. It would be more practicable to utilize the Army wherever possible to aid in disaster relief keeping in mind its strengths, which are as follows :-

- Well organised and equipped for primary role.
- Highly motivated and disciplined.
- Quick response time to any given task.
- Valuable resources and ethos.
- Army always ready for national cause.
- Apolitical character and impartial by nature.
- Compassionate approach.
- Ability to operate under adverse conditions,
- Will to serve.

Principles of Employment of Armed forces

The operations of the armed forces whenever called upon to assist the civil authority in rendering relief are governed by certain guiding principles. These are enumerated below: -

- Judicious Employment of Armed Forces. The assistance by armed forces should be requisitioned only when it becomes absolutely necessary and when the situation can not be handled by civil administration from within its resources.
- Immediate Response. When natural and other calamities occur, the speed for rendering aid is of paramount importance. It is clear that under such circumstances prior sanction for assistance may not always be possible. In such cases, the army when approached for assistance should provide the same without delay. No separate government sanction for aid rendered in connection with assistance during natural disaster and other calamities is necessary.
- Command of Troops. The army units while operating under these circumstances continue to be under command of their own commanders and aid rendered is based on task basis. Civil administration is to coordinate and not to command.
- No Menial Tasks. While assigning task to the troops it must be remembered that army is not utilised for menial tasks. Also, the army should not be utilised for disposal of dead bodies as it is a

socio-religious issue and army may get a bad name in recognizing the religious aspect of dead bodies.

- Requisition of Aid on Task Basis. The requisition of army should not be in terms of number of columns, engineer and medical teams, instead the civil administration should spell out task and leave it to army authorities to decide the force level, equipment and methodology to tackle the situation.
- Regular Liaison and Co-ordination. In order to ensure that optimum benefit is derived out of armed forces employment, regular liaison and co-ordination needs to be done at all levels and contingency plans made and disseminated to the lowest level of civil administration and the army.
- Regular Liaison and Co-ordination. In order to ensure that optimum benefit is derived out of armed forces employment, regular liaison and co-ordination needs to be done at all levels and contingency plans made and disseminated to the lowest level of civil administration and the army.
- Integration of all Available Resources. All available resources, equipment, accommodation and medical resources with civil administration, civil firms, NGOs etc need to taken into account while evolving a disaster relief plan. All the resources should be integrated to achieve optimum results. Assistance from outside agencies can be super imposed on the available resources.
- Early De-requisitioning. Soon after the situation in disaster affected area has been brought under control of the civil administration. Armed forces should be derequisitioned.

Stages of Disaster Relief

Disaster Management could be broken up into the following four sequential though not necessarily exclusive stages:

- **Preparatory Stage:** This corresponds to the pre-disaster period and includes disaster prediction, warning and alert systems, preventive measures and issue of contingency plans and checklists for potential disasters. During this stage appropriate organisational infrastructure provisioning could be set up, standard operating procedure formulated, communication equipment provisioned and rehearsals conducted.
- **Emergency Stage:** This stage commences from the warning of disaster to the period immediately after the disaster strikes and aims at providing immediate succour to the affected people and bringing a semblance of order in the disaster affected area.

- **Rehabilitation Stage:** This period covers short term measures to restore essential services, communication and normal community life.
- **Reconstruction Stage:** This is a long-term measure aimed at providing adequate relief to the affected people.

Actions by Armed Forces in Various Stages of Disaster

- **Preparatory Stage:** During this stage the following activities should be conducted: -
  (a) Establishment of liaison with state and local level authorities.
  (b) Identification of possible areas of employment.
  (c) Understanding the overall disaster relief plan and formulation of own contingency plan.
  (d) Tasking and preparation for execution of contingency plans
  (e) Local level liaison and reconnaissance if required.
  (f) Briefing of troops and rehearsals if required and if possible for those types of disasters, which are recurring in nature.

- **Emergency Stage:** During this stage in case magnitude of the problem is high enough to warrant the requisitioning of the armed forces, the following activities are carried out by the troops;

  a) On being warned for disaster relief operations the troops are warned and prepared for the task
  b) Final tasking and co-ordination.
  c) Move to disaster area.
  d) Establishment of controlling HQ and conduct of relief.
  e) Division of area into various segments.
  f) Evacuation of victims to safer places.
  g) Assist in bringing a semblance of order in disaster affected area,
  h) Provision of medical aid and other relief.
  i) Use of armed forces helicopters.
- **Rehabilitation Stage:** During this stage the armed forces may be utilised to assist the civil administration to restore essential services, communication etc. The armed forces need to be derequisitioned the moment semblance of normalcy is restored.

Measures to Enhance Efficiency

- All requisite measures are existent in almost all states, the problem if any is in their implementation. The State authorities should be made entirely accountable for disaster relief. Army representatives

should be incorporated in all committees dealing with disaster relief. Heads of the Central Police organisations posted in the vicinity should also be incorporated into such committees.

- Assistance by the Armed Forces should be requisitioned only when it becomes absolutely necessary and even then only for such special purposes as cannot be handled by the State Government. Assistance by the Armed Forces should be strictly in accordance with the Instructions on aid to Civil Authorities by the Armed Forces.
- The Army on its part should take measures to improve its state of training and equipment holding in disaster prone areas. Members of the civil administration should be made conversant with the principles for employment of armed forces.

"The basic problem is the Government's inability to shift its policy from post disaster response to pro-active pre disaster measures"

5.3 RESCUE AND RELIEF PROVISIONS BY POLICE

Police organization has to see itself as a major player in disaster management. It will continue to have the first responder role given its proximity to the incident site and relationship with the people. Therefore, it has to bring about change in its approach. It has to adopt disaster management function as a one of its primary functions. State & district level authorities cannot afford to wait for response specialized forces such as NDRF all the time. Moreover, on many occasions, it might not be advisable or feasible to obtain/deploy armed forces and NDRF. Hence state police must be prepared as response force.

The local police must be trained, equipped and supported with legislation and logistics so that they find themselves capable to support the victim in the “golden hour”. Subsequently they can play supporting role to the specialist forces if they come in bigger emergency cases. On many occasions Special Forces are not required and the local police may retain the primary role to help the needy. The outside forces are also handicapped in operating in unknown area, among unknown people and here is the key to critical role of police.

The Police are among the first responders in any crisis because,

- Local police arrive first
- Possess well developed communication system
- Familiar with local terrain
- Wider reach, every village covered
- Better knowledge of local people feelings and mind-sets
- People recognise police as first responder uniformed, disciplined

While functions of local police are well defined for internal emergency, same is not true for natural disasters. But wherever earthquake or flood occurs, the police get involved from beginning. Hence if their role is designed and documented in police manuals, disaster management acts and policies, it will, to that extent facilitate immediate effective response, at least in the first few hours which are most crucial. Hence the need to frame SOPs that can help the police forces in being prepared and respond appropriated whenever any disaster happens

Role of Police before disaster-Prevention and Preparedness phase

Superintendent of Police of a district is ex-officio member of District Disaster Management Authority (DDMA) and in this capacity he could play important role in prevention and preparedness phase.

Emergency Traffic Plan: Being familiar with the local terrain, Police should prepare emergency traffic plan including detail mapping with focus on strategic points, which may used at the time of incident for safe transporting of personnel, resources and relief goods to and from the affected area.

Detail communication Plan: Police has a robust and effective Communication system that is also for non police functions. It can also be used to propagate information and warning of threatening disaster. Thus police can develop communication protocols for responding during disasters eg designate separate channels for rescue, relief for example. Chaukidars who are present at village level could play important role to collect sensitive information and disseminate emergency warning and other information.

Identification of Building: PS personnel travel in their area frequently. They can be of great help in identifying buildings and campus which are easy to access and could be used as relief centres/relief camps and godown for storage of food grains and other rescue and relief materials.

Security Plan: At the time of any serious incident it becomes inevitable to provide security to victims, responders and to relief materials at storage point and during transit. Resources deployed too may require security

Resource Mapping: It is very important to locate essential resources at very beginning of search and rescue works. It has been experienced during the Kosi flood 2008 that in rescue and relief works even small and tiny elements become very important. So local police could identify, locate and document general essential elements useful for different kind of disasters.

These resources may have to be operated under the guidance and protection of police as done during operation of boats in Kosi disaster of 2008

Training: Men in uniform (Police) are most visible and reliable government agency nearest to the people in difficult times. Police should conduct mock exercises with various stakeholders and should test and update their different plans.

Role of police during disaster-Emergency response phase

The primary role of police is evident during the management of the actual disaster situation. It includes:

Search and Rescue (SAR): The primary function during a disaster. Policemen must be trained and equipped to begin rescue at the earliest to take advantage of the "platinum 15". They would be able to provide immediate relief to the victims till specialized forces arrive. During such activity, police has to provide protection to boats that are put in operation during floods. Resources, e.g.

- Deployment of policeman on the boat plying in floods helps prevent overcrowding of boats and prevent capsizing.
- Such boats are provided with handheld wireless sets one to keep tracking its movements and provide help in disasters
- To provide security to resources from unscrupulous elements. eg. During Kosi 2008, boats were captured by local goons.

Deployment of resources:-Police can help in deployment of resources, provide safety and security to the resources and the persons manning them.

Restoration of communication system/liasoning with rescue teams:

Telephonic communication breaks down since the telephone towers/offices get destroyed with the result that landline and mobile phones stop working. Wireless communication might be the only means left. During floods or any other disaster most of the rescue teams operate in unknown territories under adverse conditions where landmarks are either washed away or destroyed. During Kosi disaster 2008, Army & NDRF boats got lost and they had to spend nights outside the camps. The new course of the river had very fast current as a result of which, they could not reach their locations by end of the day. Several times, these boats got capsized. The army, navy and the NDRF had their own communication systems but it

needed to be integrated with the district communication setup so that information of any emergency could be disseminated quickly and support reached at the earliest. Wireless communication was established on all the boats. Similar communication with wireless has to be established in operational camps. Wireless can be provided to rescue and relief teams.

Make available police communication resources for other DM task eg. Relief distribution, medical teams

Standby for emergency communication networks

Prevention of commission of cognizable offences including all offences against property, human body and public tranquility:-
During disaster situation people abandon their houses with or without belongings. The safety and security of such houses and belonging is at risk. During such time people are without jobs hence incidence of crime generally increases. It also provides opportunities for the lumpen element such as robbers and thieves to commit cognizable offences i.e. looting etc., against property. Similarly the vulnerable section of society particularly women and children susceptible to crimes against human body. Police can provide safety to such persons by active patrolling during disasters and by arresting the suspects beforehand.

- Investigation of cases

Security during Relief distributions/ Relief management:- Relief distribution is an important aspect of disaster management.

- The designated relief distribution centre is generally located in the interiors. Therefore the security of personnel engaged in distribution and the material to be distributed (Cash and Kind) requires special attention.
- Similarly many bank branches get closed and therefore cash is sent from far of places for distribution as relief of maybe mobile ATMs will be used for people requiring cash. Police is required to provide security of the Cash and or ATMs.
- Likewise the security of grains and other relief material eg food packets being transported from different places to distribution centers is also important. Dedicated escorts are needed from the FCI godowns, railway stations to temporary storage/ distribution centers. The security of the food godowns, Railways stations where relief materials are received also require security.
- Relief material sent by NGOs etc. is also important and Police can play significant role in this regard.
- During the actual distribution of relief large numbers of people gather at the relief centre. The crowd management becomes

important. The regulation of the process of distribution of relief can help in maintaining law and order.

Isolate disaster sites and control site access for safety of victims, general public and efficiency of incident operation

Camp management:- Security of camp inmates, officials and volunteers engaged in running of camps including health workers is core function. During Kosi disaster over 400 relief camps had people from many villages with different religious, political and caste backgrounds and thus had potential for friction. This requires deployment for law & order maintenance.

- Hundreds of government and non-government employees/volunteers are engaged in running of kitchens, medical centers, sanitation units etc. They require protection all the time.

Emergency transportation and Traffic Regulation: Police has to facilitate the movement of rescue, medical, fire and other essential services.

- During Kosi disaster
- Highways roads had to be kept free for movement of rescue teams and relief material.
- Check posts were established for ensuring safety of relief material. Road patrol was arranged for safe passage of army convoys, boats and other resources sent from outside and vehicles for army was arranged.
- Control traffic during and after the incident and maintain access and egress route
- Make available police resources to transport rescue and relief personnel and victims
- Assist in managing huge logistical problems in handling relief supplies

Coordination with various agencies:- During disasters various agencies such as NDRF, SDRF, Paramilitary forces such as BSF, CRPF, CISF etc, Army, IAF, Cost Guard, medical teams from outside the state arrive at the disaster sites. These external agencies are not informed about the physical terrain, Route Charts etc. The police can coordinate the activities of these agencies. The coordination among police and other agencies needs to be standardized in clear procedures.

- Police can function as link with external agencies since most are uniformed. NDRF today is the most visible trained emergency response force made up of personnel of CRP, BSF and CISF.

Rescue teams from Army, Coast Guard, IAF and other states also policemen based.

- The coordination among police and other agencies needs to be standardized in clear procedures. Protocols are needed for deploying resources in case of a disaster in a manner that is well-coordinated between local, state, and central emergency agencies including armed forces.
- Importantly police organizations do not stand alone in doing what is necessary to deal with major disasters. Instead, police agencies must be integrated and be able to cooperate with other police and emergency agencies.

Casualty information/ Disposal of dead:- The identification of people involved in accidents/emergencies is a Police responsibility. All enquiries could be handled by police station staff.

- Tracing of missing persons and notification to their next of kin could be another area of work allotted to police
- Disposal of dead bodies and documentation of dead and the missing for the benefit of next of kin to claim the compensation and ex-gratia.

Family Liaison Officers:- The Police could appoint family liaison officers (FLOs) to the families of those who have died. The FLOs are specially trained police officers who, if requested, will liaise between the families and the media as a way of minimizing intrusion and distress.

Media management:- During any disaster situation information flow through the audio-visual as well as print media. The reports from need to be verified as soon as possible for quick response. The police can not only verify the facts of the information but also play an important role in briefing the media regarding the actual situation. This can help in checking the spread of rumours. In certain countries, Police officers play role of the Police Press Officer at the scene of any major emergency to co-ordinate the response to all media enquiries.

VIP Security:- VIPs visit the affected area and relief camps frequently. Many a times, politically opposed/ dissatisfied resort to protests thereby posing threat to VIP and law and order. This must be handled by police.

Crowd Management: Both at disaster site as well as at the relief distribution centrea large number of people gather as on lookers as well as the kith and kin of the victims. Sometimes the dissatisfied people disrupt the traffic; road and rail. The police can play important role in management of the crowd.

Role of police after disaster-Restoration Face:

- In long term operation of evacuation shelters the issues over the shelters would change and if they are not addressed soon they would create law and order problem. Therefore it is important to find the causes of the problems as soon as possible, access the situation and reviews the previous ways.
- Accommodation of persons with special meds in evacuation shelters such as small children, pregnant women and mothers with nursing infants etc. requires utmost care. In a limited shelter space it is very important to provide special rooms for them. Police can player very important role in this respect.
- At the time of relief distribution and primary accommodation of victims support for the disabled and issues related to hygiene, infectious disease should be looked after carefully other wise it create serious problems to restoration face**.**
- Police can play an important role in selection of beneficiaries of houses and other assets to the victims to avoid complications and litigation.
- **Restoration of Critical infrastructure:-** Disaster usually affects the critical infrastructure such as road, telecommunication, health centers, school, electricity supply etc. Police can provide protection to the agencies which are involved in restoration of such infrastructure because people who are rendered jobless after disaster may hinder the process.
- **Safe exit of the personnel involved in disaster management:-** After the disasters due to fatigue laxity might seep in to the system. Although the overall law and order situation is monitored and maintained by the police, it becomes very important after the disaster for the safe exit of the personnel from outside agencies involved in management of the disaster i.e People from NGOs, INGOs, medical teams etc.
- **Feedback/assessment:-** Since the police is the key factor in managing the disaster, their feedback/ assessment is very important in updating the plans for the future.
- **Contingency planning:-** The police familiar with the local terrain and the resources available in the locality. They can plan the actions taken at the time of the disaster before hand.

(SOP for Police during Natural Disaster)

5.4 RESCUE AND RELIEF PROVISIONS BY FIRE SERVICES

The role of fire services is very crucial in any emergency. In fact, in the developed world, fire services are not only employed for firefighting but

also for rescue operations as emergency services. As per the Standing Fire Advisory Committee, on the basis of laid down norms, existing deficiencies as regards fire stations, fire fighting vehicles and personnel in the country are as follows:

- Fire Stations---97.54%
- Fire Fighting and Rescue Vehicles------------------------80.04%
- Fire Personnel---96.28%

Taking note of these deficiencies, NDMA made a forceful case with the 13th Finance Commission for allocation of funds to revitalize the fire services. Realising the importance and need to revamp fire services in the country, the Finance Commission has allotted Grants in Aid specifically to the states which have made specific proposals before it. It has also more than doubled the grant to local bodies in comparison to the allocation made by the 12th Finance Commission and simultaneously recommended that the local bodies should spend money on Fire Services.

NDMA has released National Disaster Management Guidelines on Scaling, Type of Equipment and Training of Fire Services in the country.

5.5 RESCUE RELEIF PROVISIONS BY PANCHAYAT RAJ INSTITUTIONS

Disasters are not totally discrete events. Their possibility of occurrence, time, place and severity of the strike can be reasonably and in some cases accurately predicted by technological and scientific advances. It has been established there is a definite pattern in their occurrences and hence we can to some extent reduce the impact of damage though we cannot reduce the extent of damage itself. This demands the study of disaster management in methodical and orderly approach. A disaster is said to take place precisely because the losses originated by a given event overwhelm the capacity of a population (local, regional or national) to respond and recover from it. Disaster risk emerges from the interaction between a natural hazard - the external risk factor – and vulnerability - the internal risk factor. Disaster may be termed as “a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of the affected society to cope using its own resources” (UN/ISDR, 2004).

Role of PRI bodies in Disaster

The PRI is a statutory body elected by the local people through a well-defined democratic process with specific responsibilities and duties. The elected members are accountable to the people of the ward, rural

community, block and the district. Keeping the above in view, the PRI, the representative body of the people, is the most appropriate institution from village to the district level in view of its proximity, universal coverage and enlisting people's participation on an institutionalized basis. Their close involvement will go a long way in getting people prepared for countering natural disasters as well as involve them in all possible preventive and protective activities so that the impact of the disasters are mitigated and the people are able to save their lives and property. The PRIs can act as catalysts to social mobilization process and tap the traditional wisdom of the local communities to complement the modern practices in disaster mitigation efforts. Besides PRIs will also provide a base for integration of various concerns of the community with that of the NGOs and Community Based organizations (CBOs) which are engaged in various developmental activities at the grassroots level. Hence there is a need to define the role of PRIs in Disaster Management and sensitise local communities through them to develop coping mechanism in preparedness and mitigation measures of disaster to minimize its destructive effect on life and property at local level. The disaster management cycle requires massive efforts in all its aspects like prevention, mitigation, preparedness, response, restoration, rehabilitation reconstruction work. These include addressing situations like lack of coordination at all levels in the restoration and relief work, non-involvement of the people, over dependency on government, inadequate relief and restoration work, lack of awareness among people regarding potential danger of cyclones and other disasters, lack of knowledge on availability of funds and resources etc,. Thus, the entire preparedness with regard to meeting emergencies like cyclone, flood and drought etc., calls for a constructive role and greater commitment on the part of the PRIs (Goel, 2006). The PRI members can play a role of leadership in Disaster Management at all stages. Right from the preparatory stage up to the handling of the long term development activities for risk reduction, PRI can lead in several ways. Gram panchayat has played a pivotal role in disaster management. The impact of disasters on people living in vulnerable areas and losses to their property can be minimized by a pro-active role played by PRIs at the grassroots level.

How PRI bodies can lead

It must be conceded that wherever it has strong roots, PRI has played a crucial role in mobilizing people in various situations of crisis. However, it is a fact that it is difficult to pre empt disasters and also to predict their magnitude. But the impact of disasters on people living in vulnerable areas and losses to their property can be minimized by a proactive role played by PRIs at the grassroots level. Apart from great organizing skills, it may call for courage and leading from the front. The PRI members can play a role

of leadership in Disaster Management at all stages. Right from the preparatory stage up to the handling of the long term development activities for risk reduction, PRI can lead in several ways. A broad outline may include activities like**:**

Pre-Disaster

- Organizing awareness campaign and promoting community education on disaster preparedness
- Articulation of community need for developing preparedness plan through community involvement and Panchayats ownership.
- Identifying the resource gaps both physical and manpower and replenish the same through capacity building.
- Establishing synergy with local agencies including Non-Governmental Organizations (NGOs)/ Community Based Organizations (CBOs).
- Dovetailing Risk Reduction into various development programs of national and state governments.
- Encouraging people to insure assets and livestock.
- Establishing convergence with local institutional structures created for implementing education, health, livelihood and social justice and so on.
- Activating the disaster Management Plans with the participation of the community.
- Formation of Task forces and their capacity building

During Disaster

- Arranging emergency communication through available resources.
- Evacuation to temporary shelter and running relief camps.
- Supplementing rescue and relief efforts in coordinating different agencies.
- Monitoring of Relief distribution.
- Safe disposal of carcass and arranging safe drinking water and sanitati**on.**

Post Disaster

- Damage assessment particularly assisting in identifying victims for compensation and its distribution.
- Formulating rehabilitation and reconstruction plan of houses and other local infrastructures.
- Enforce minimum specification for safe reconstruction
- Supervise and monitor long term reconstruction and mitigation projects. Mobilizing special funds to use disaster resistant construction technology in vulnerable areas.

Role of Panchayat in managing information

Collection

Information plays a vital role at the time of need like the disasters. Panchayats should make an attempt to collect information from all relevant sources. In addition, they should make an attempt to check its authenticity and validity before passing it on to the community. Some of the sources from which Panchayats could collect information may be Radio, Television, Govt. sources, District Disaster Mitigation Cell and from Newspapers and News Agencies

Analysis

Panchayats can form a committee of responsible persons who have access to the sources mentioned above so that they can get the right information at right time In this respect, some of the senior citizens of the local communities should be made members of this committee, so that they can help in identifying certain local geographical indicators, which would enable people to predict future climatic conditions.

Dissemination

Panchayat functionaries can disseminate the information to the people in several ways. This can be done through notice boards, radio, TV, telephone, appropriate signals, word of mouth, and volunteers of disaster management teams as well as through the local NGOs.

Role of panchayat in planning and capacity building

Community-based disaster preparedness (CBDP) approaches are increasingly important elements of vulnerability reduction and disaster management strategies. They are associated with a policy
trend that values the knowledge and capacities of local people and builds on local resources, including social capital. CBDP may be instrumental not only in formulating local coping and adaptation strategies, but also in situating them within wider development planning.

Panchayats have a very important role to play in both preparedness and mitigation in mobilizing and organizing the people as well as facilitate their capacity building. Communities should be motivated to make their own short term and long – term DM plans for Disaster Mitigation for which Panchayats bodies need to lead from the front in building their capacities through regular training in this field. A sustained effort in this direction will not only reduce the dependency of the people on the Govt. but also help mobilize sizeable resources locally to counter disasters and reduce the burden of the Govt. to a great extent.

Issues in role of PRIS in disaster preparedness and management

The role of Panchayats is important in view of their proximity to the local community, universal coverage and enlisting people's participation on an institutionalized basis. It is possible to ensure accountability and transparency through the institution of Gram Sabha. Hence there is an emphasis to involve Panchayats in Disaster Management and sensitize local communities through them to develop coping mechanism in preparedness and mitigation measures to minimise its destructive effect on life and property at local level. In the event of a disaster all people in its impact zone are affected but the poor and vulnerable (disabled, widow, orphans and children) people suffer the most, as their ability to absorb losses is low.

The specific benefits of community participation accrue from involving people in their own development, as can be seen from the following considerations: People can be sources of useful ideas, such as those from indigenous technical knowledge and skills; Also, the communities and people can participate in decision-making process with regard to implementation of development schemes, which are pertinent to disaster reduction measures. And thus, people's voices and choices can be more appropriately reflected in development programs and the commitment of the implementing functionaries like leaders, officials and NGOs can be reinforced further (GOI-UNDP 2002-2009)
(Role of Panchayats in Disaster: A New Vista for Disaster Management, 2018)

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What does 'Relief' refer to?

ii. What are the Stages of Disaster Relief?

iii. What do the PRI analyze during disaster?

iv. During disaster why Resource Mapping is important?

5.6 LET US SUM UP

This chapter gives us an explanation about the rescue and relief phase which talks about the need assessment during disaster. It also draw attention towards various department like Army, Police, Fire service and

the Panchayat Raj Institutions their roles, responsibilities, the safety measure and their active participation at the at time disaster from pre to post disaster, until the situation changes to normal lifestyle.

5.7 UNIT END EXERCISE

1. What are the major roles in Rescue & Relief Phase?
2. Write down the salient features of Rescue & Relief Provisions by Army/
3. Explain the important of Rescue & Relief Provisions by Police.
4. 'Rescue & Relief Provisions by Fire Services is the plays a vital role at the time of disaster'- Justify
5. Discuss the Issues in role of PRIS in disaster preparedness and management

5.8 ANSWER TO CHECK YOUR PROGRESS

- Relief refers to the provision of essential, appropriate and timely humanitarian assistance to those affected by a disaster, based on an initial rapid assessment of needs and designed to contribute effectively and speedily to their early recovery.
- The Stages of Disaster Relief are: Preparatory Stage, Emergency Stage, Rehabilitation Stage, and Reconstruction Stage.
- Panchayat will form a committee of responsible persons who have access to the sources mentioned above so that they can get the right.
- Resource Mapping is very important during disaster to locate essential resources at very beginning of search and rescue works and provide information at right time.

5.10 SUGGESSTED READINGS

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UNIT VI - PSYCHOLOGICAL

Structure

6.1 PSYCHOLOGICAL FIRST AID

PFA is important, first-line psychosocial support for people affected by crisis events – PFA, like medical “first aid”, is not enough on its own

- Immediately after a crisis event, those who assist are often family members, neighbors, teachers, community members and first responders of various kinds (emergency medical teams, police, firefighters)
- Term “PFA” was first coined in the 1940s but its use has increased in modern-day crisis events.

Humane, supportive & practical assistance to fellow human beings who recently suffered a serious stressor:

- Non-intrusive, practical care and support
- Assessing needs and concerns
- Helping people to address basic needs (food, water)
- Listening, but not pressuring people to talk
- Comforting people and helping them to feel calm
- Helping people connect to information, services and social supports
- Protecting people from further harm

Need For PFA

- People do better over the long term if they Feel safe, connected to others, calm & hopeful
- Have access to social, physical & emotional support
- Regain a sense of control by being able to help themselves

Who can benefit from PFA?

- Boys, girls, women and men who have recently experienced a crisis event and are distressed
- Some people need more than PFA alone such as people with life-threatening injuries or unable to care for themselves or their children

When should PFA be provided?

When encountering a person in distress, usually immediately following a crisis event.

Where should PFA be provided?

Anywhere that is safe for the helper and affected person, ideally with some privacy as appropriate to the situation.

Respect safety, dignity and rights

Safety: Don't expose people to further harm, ensure (as best you can) they are safe and protected from further physical or psychological harm

Dignity: treat people with respect and according to their cultural and social norms

Rights: act only in people's best interest, ensure access to impartial assistance without discrimination, assist people to claim their rights and access available support

- Be aware of other emergency response measures.
- Care for caregivers: practice self-care and team-care

Helping Responsibly: Ethical Guidelines

Do's

- Be honest and trustworthy.
- Respect a person's right to make their own decisions.
- Be aware of and set aside your own biases and prejudices.
- Make it clear to people that even if they refuse help now, they can still access help in the future.
- Respect privacy and keep the person's story confidential, as appropriate.
- Behave appropriately according to the person's culture, age and gender.

Don’ts

- Don’t exploit your relationship as a helper.
- Don’t ask the person for any money or favor for helping them.
- Don’t make false promises or give false information.
- Don’t exaggerate your skills.
- Don’t force help on people, and don’t be intrusive or pushy.
- Don’t pressure people to tell you their story.
- Don’t share the person’s story with others.
- Don’t judge the person for their actions or feelings.

PFA Action Principles

Prepare

- Learn about the crisis event.
- Learn about available services and supports.
- Learn about safety and sec

Look

- Observe for safety
- Observe for people with obvious urgent basic needs
- Observe for people with serious distress reactions

Listen

- Make contact with people who may need support.
- Ask about people’s needs and concerns.
- Listen to people and help them feel calm.

Link

- Help people address basic needs and access services
- Help people cope with problems.
- Give information
- Connect people with loved ones and social support

6.1.1 Health Camps

Disaster has both acute and chronic effects on the physical and mental health of the affected population. In the aftermath of disaster injuries, spread of communicable diseases and worsening of non-communicable diseases is reported in several studies.1-4 in the disaster-affected area, medical camps are run by Government, Army, and NGOs to provide medical relief to the affected population, but there is a lack of publications in India on the functioning of these camps. Through this work, we attempt to give an insight on the types of medical illness seen, services provided and challenges faced in functioning of these camps in India after a flood disaster. In September 2014, the Jammu and Kashmir region was hit by

heavy floods caused by torrential rainfall; nearly 284 people died due to floods. According to the Home Ministry of India, several thousand villages across the state were hit, and 350 villages were submerged. More than 2,00,000 people were rescued, including 87,000 from Srinagar city.5-7 Medical camps to provide medical relief were set up by the army in the flood-affected area. This study analyses the data collected from two such camps. First camp (FC) was situated at airport adjacent to the helicopter landing area, started on 10th September and was meant mainly to attend to medical needs of people rescued through air sorties; this camp continued for 5 days. The camp consisted of a tent with the arrangement of 4 beds for emergency inpatient care. The staff at this camp consisted of one MBBS doctor and two nursing personnel. The second camp (SC) was started on 12th September. It was situated just adjacent to flood-hit area Rajbagh in Srinagar and provided medical services to the flood-affected population in this area; the camp ran for 7 days. Camp was created using tent adjacent to busy road, and there was no arrangement for inpatient admission. The staff at this camp consisted of two MBBS doctors and 1 pharmacist. The authors as a part of disaster relief team from the National Institute of Mental Health and Neurosciences got to work and observe proceedings at both these camps and along with medical care were able to assess the psychosocial needs of patients presenting there and provided psychological first aid.

Aims and Objectives

- To identify medical needs of the flood-affected population.
- To identify problems faced in running a medical relief camp in flood disaster-affected area.

Participants and Data

Medical records were created and kept for all patients seen at the two camps. Patients who presented to camps were registered with personal information regarding name, age, and sex. A note of presenting complaints, provisional diagnosis as well as medicine prescribed and intervention done was made. Total 907 patients presented at the FC and 2604 at SC. These medical records were reviewed later for data extraction. Furthermore, interview of the medical personnel was taken at the end of each camp to identify the difficulty faced by them in running these camps.

All patients who were requiring tertiary setup care were given emergency treatment, and then, they were sent to higher centers in Jammu, Chandigarh, and Delhi through air with the help of Indian Air Force (IAF)

Apart from the registered patients, there were many people coming to camp for getting knowledge regarding how to prevent outbreak of infectious disease, vaccination to prevent epidemic outbreak and how to purify drinking water. Free drugs, Bottled water, Chlorine tablets, and masks were also distributed at these camps

Medical complaints were classified as:

- Trauma: Include laceration, abrasion, infected wound, contusion, hematoma, sprain, pain, and other effects of injury were classified as trauma.
- Skin-related problems: Infected skin lesions, rashes with itching were categorized under skin-related problems.
- Acute respiratory infections and their symptoms and signs were regarded as an acute respiratory problem.
- GIT-related complaints: Comprising mainly of diarrhea and abdominal cramps.
- Chronic non-communicable disease: Patients who had chronic conditions such as diabetes, hypertension, hypothyroidism, and asthma were classified as chronic non-communicable disease
- Psychiatric illness: Patient with known psychiatric illness before onset of flood
- Somatic complaints: Complaints of generalized body ache and headache without any above complaints
- Others: Rest which cannot be classified in any above categories comprising mainly of patients that came for a health checkup, especially blood pressure measurement without any history or current problem.
- Similar classification was used in tsunami disaster medical relief camp by Korean team in Srilanka.

Future Directions

As India is constantly facing disasters and MBBS doctors are mostly deployed in such camps, there is a need for training in disaster management for doctors as a part of MBBS curriculum. If possible, it will be more useful to post specialist doctors in disaster area for better management of the patient. Alternatively, telemedicine can be used to provide specialist support in disaster-affected area It is also highly recommendable to have a national or state level disaster medical assistance team comprising of trained health professionals consisting of specialist doctors, emergency physicians, nursing personnel, and pharmacists with the required infrastructure to set up an emergency medical relief camp in the disaster hit area.22-24 This type of team can be mobilized soon after disaster and can be very effective in providing high level quality medical care in the disaster-affected area.

6.1.2 Relief Centres

Most of the disaster situations are to be managed at the State and District levels. The Centre will play a supporting role and provide assistance when

the consequences of a disaster exceed District and State capacities. The Centre will mobilise support in terms of various emergency teams, support personnel, specialized equipment and operating facilities depending on the scale of the disaster and the need of the State or District. Although active assistance to an affected State/District will be provided only after the declaration of a national level disaster (L3), the National response mechanism has to be prepared and any impending State or District disaster has to be monitored in order to provide immediate assistance whenever required. For this purpose the National response mechanism has to be pre defined in terms of process, related handbooks, and checklists that will have to be used during a disaster.

6.1.3 Water and Sanitation Issues

Prepare an Emergency Water Supply:

- Store at least 1 gallon of water per day for each person and each pet. Consider storing more water than this for hot climates, for pregnant women, and for people who are sick.
- Store at least a 3-day supply of water for each person and each pet. Try to store a 2-week supply if possible.
- Observe the expiration date for store-bought water; replace other stored water every 6 months.
- Store a bottle of unscented liquid household chlorine bleach to disinfect your water and to use for general cleaning and sanitizing. Try to store bleach in an area where the average temperature stays around 70°F (21°C). Because the amount of active chlorine in bleach decreases over time due to normal decay, consider replacing the bottle each year.

Water Containers (Cleaning and Storage)

Unopened commercially bottled water is the safest and most reliable emergency water supply.

Use of food-grade water storage containers, such as those found at surplus or camping supply stores, is recommended if you prepare stored water yourself.

Before filling with safe water, use these steps to clean and sanitize storage containers:

- Wash the storage container with dishwashing soap and water and rinse completely with clean water.

- Sanitize the container by adding a solution made by mixing 1 teaspoon of unscented liquid household chlorine bleach in one quart of water.
- Cover the container and shake it well so that the sanitizing bleach solution touches all inside surfaces of the container.
- Wait at least 30 seconds and then pour the sanitizing solution out of the container.
- Let the empty sanitized container air-dry before use OR rinse the empty container with clean, safe water that already is available.

Avoid using the following containers to store safe water:

- Containers that cannot be sealed tightly
- Containers that can break, such as glass bottles
- Containers that have ever held toxic solid or liquid chemicals, such as bleach or pesticides
- Plastic or cardboard bottles, jugs, and containers used for milk or fruit juices

For proper water storage:

- Label container as "drinking water" and include storage date.
- Replace stored water that is not commercially bottled every six months.
- Keep stored water in a place with a fairly constant cool temperature.
- Do not store water containers in direct sunlight.
- Do not store water containers in areas where toxic substances such as gasoline or pesticides are present.

Disaster Supplies Kit (Hygiene Supplies)

Before an emergency, make sure you have created a Disaster Supplies Kit.

Handwashing

Keeping hands clean during an emergency helps prevent the spread of germs. If your tap water is not safe to use, wash your hands with soap and water that has been boiled or disinfected. Follow these steps to make sure you wash your hands properly:

- Wet your hands with clean, running water (warm or cold) and apply soap.
- Rub your hands together to make a lather and scrub them well; be sure to scrub the backs of your hands, between your fingers, and under your nails.
- Continue rubbing your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.

- Rinse your hands well under running water.
- Dry your hands using a clean towel or air dry them.

A temporary hand washing station can be created by using a large water jug that contains clean water (for example, boiled or disinfected).

Washing hands with soap and water is the best way to reduce the number of germs on them. If soap and water are not available, use an alcohol-based hand sanitizer that contains at least 60% alcohol. Alcohol-based hand sanitizers can quickly reduce the number of germs on hands in some situations, but sanitizers **do not** eliminate all types of germs.

Wash hands with soap and clean, running water (if available):

- Before, during, and after preparing food
- Before eating food
- After using the toilet
- After changing diapers or cleaning up a child who has used the toilet
- Before and after caring for someone who is sick
- After blowing your nose, coughing, or sneezing
- After touching an animal or animal waste
- After touching garbage
- Before and after treating a cut or wound

Bathing

Bathing or showering after a water-related emergency should only be done with clean, safe water. Sometimes water that is not safe to drink can be used for bathing, but be careful not to swallow any water or get it in your eyes.

If you have a drinking water well, listen to your local health authorities for advice on using your well water for showering and bathing. If extensive flooding has occurred or you suspect that your well may be contaminated, contact your local, state, or tribal health department for specific advice on well testing and disinfection.

Dental Hygiene

- Brushing your teeth after a water-related emergency should only be done with clean, safe water. Listen to local authorities to find out if tap water is safe to use.
- Visit the Safe Drinking Water for Personal Use page for more information about making your water safe for brushing your teeth.
- You may visit CDC's Oral Health Web site for complete dental hygiene information.

Wound Care

Keeping wounds clean and covered is crucial during an emergency. **Open wounds and rashes exposed to flood waters can become infected. To protect yourself and your family:**

- Avoid contact with flood waters if you have an open wound.
- Cover clean, open wounds with a waterproof bandage to reduce chance of infection.
- Keep open wounds as clean as possible by washing well with soap and clean water.
- If a wound develops redness, swelling, or oozing, seek immediate medical care.
- Vibrios are naturally occurring bacteria that live in certain coastal waters. They can cause a skin infection when an open wound is exposed to salt water or a mix of salt and fresh water, which can occur during floods.

The risk for injury during and after a hurricane and other natural disasters is high. Prompt first aid can help heal small wounds and prevent infection. Wash your hands with soap and water before and after providing first aid for a wound to help prevent infection. Use an alcohol-based hand sanitizer that contains at least 60% if soap and water are not available. Tetanus, other bacterial infections, and fungal infections are potential health threats for persons who have open wounds.

Seek medical attention as soon as possible if:

- There is a foreign object (soil, wood, metal, or other objects) embedded in the wound;
- The wound is at special risk of infection (such as a dog bite or a puncture by a dirty object);
- An old wound shows signs of becoming infected (increased pain and soreness, swelling, redness, draining, or you develop a fever).

(Centre for Disaster Control and Prevention)

Disaster Sanitation

Emergencies and disasters can occur anywhere in the world, affecting human health, people's lives and the infrastructure built to support them. Environmental health problems arising from emergencies and disasters are connected to their effects on the physical, biological and social environment that pose a threat to human health, well-being and survival: shelter, water, sanitation, disease vectors, pollution, etc.

Disasters seriously disrupt the lives of individuals, and the functioning of entire communities or even whole societies. Resulting widespread human, material, economic, and environmental losses stress existing infrastructure and leave individuals in states of shock and despair. Rebuilding damaged infrastructures, such as sewage systems and water supply, not only help to restore a sense of normalcy, but also arrest the spread of disease.

The first goal of emergency response is to prevent outbreaks of waterborne diseases, caused by malfunctioning water supply, various point pollution of water resources, and lack of sanitation facilities. Top priorities for immediate response are provision of sufficient quantities of safe water, arrangement of basic sanitation, and promotion of good hygiene behavior.

Emergency preparedness is just as important. The incorporation of disaster scenarios in the planning of infrastructure and institutional, community, and societal response is a critical step towards risk management, which will reduce a population's vulnerability during and after a disaster.

Water & Sanitation for Emergency Shelters

- Assess immediate population needs and available supply.
- Protect upstream water supplies and wells; treat all surface water as polluted.
- Pump supplies to storage tanks, to be used as a basis for a more developed distribution system.
- Provide basic collection, storage and treatment facilities for protected sources.
- Prevent indiscriminate defecation through rapid provision of facilities.
- Provide safe disposal of excreta and refuse, controlling rodents and pests.
- Integrate hygiene promotion within community.
- Consider foundations for longer-term infrastructure and ensure their implementation will not be impeded in the future; in particular, ensure continued safety of local water resources which may be scarce.

Water and Sanitation

Every eight seconds a child dies of a water-related disease. Every year more than five million human beings die from illnesses linked to unsafe drinking water, unclean domestic environments and improper excreta disposal.

At any given time perhaps one-half of all peoples in the developing world are suffering from one or more of the six main diseases associated with water supply and sanitation (diarrhoea, ascaris, dracunculiasis, hookworm, schistosomiasis and trachoma). In addition, the health burden includes the annual expenditure of over ten million person-years of time and effort by women and female children carrying water from distant, often polluted sources.

Nearly a quarter of humanity still remains today without proper access to water and sanitation.

During the International Drinking Water Supply and Sanitation Decade (1981-1990), some 1600 million people were served with safe water and about 750 million with adequate excreta disposal facilities. However, because of population growth of 800 million people in developing countries, by 1990 there remained a total of 1015 million people without safe water and 1764 million without adequate sanitation.

Another problem with coverage goals is the magnitude of resources needed to achieve them. At the Global Consultation of Safe Water and Sanitation for the 1990s, held in New Delhi in 1990, it was stated that universal coverage by the year 2000 would require US$ 50 billion per year, a five-fold increase in current investment levels.

In 1992, WHO concluded its monitoring of the Decade with the estimate that a total of US$ 133.9 billion had been invested in water supply and sanitation during the period 1981-1990, of which 55% was spent on water and 45% on sanitation. Urban areas received 74% of the total and rural areas only 26%. Contrary to widespread perceptions, almost two-thirds of all funds were provided by national sources and only a third by external organizations.

WHO estimates that it costs an average of US$ 105 per person to provide water supplies in urban areas and US$ 50 in rural areas, while sanitation costs an average of US$ 145 in urban areas and US$ 30 in rural areas.

Water supply and sanitation can be viewed as a process having three interactive elements. The most fundamental of these elements is the availability of safe drinking water and sanitary means of excreta disposal. This means 20 to 40 litres of water per person per day located within a reasonable distance from the household. Safe water implies protection of water sources as well as proper transport and storage within the home. It also means facilities for bathing and for washing clothes and kitchen utensils which are clean and well-drained. Sanitary excreta disposal is the isolation and control of faeces from both adults and children so that they do not come into contact with water sources, food or people. To break the transmission chain of faecally-related diseases, good standards of personal

and domestic hygiene, which begin with hand washing after defecation, are essential.

A second element in the water and sanitation development process is the use and care of water and sanitation facilities. People must use these facilities properly to obtain the health benefits inherent in them. This means knowing how to protect and store water safely, how to maintain personal and domestic cleanliness, how to care for excreta disposal facilities and how to avoid or minimize unsanitary environmental conditions. Knowledge transfer, behaviour change and personal responsibility are the key factors.

The third of the interactive elements is the institutional support from the communities, developing agencies and government policies that provide a framework for water and sanitation improvements. Experience has shown that community-based efforts, whether in a small village or a large metropolis, are most effective in identifying and meeting peoples' needs. Governments, especially at the regional and national levels, are more effective as facilitators of the development process than providers of water and sanitation improvements.

Water contaminated by human, chemical or industrial wastes can cause a variety of communicable diseases through ingestion or physical contact:

Water-borne diseases: caused by the ingestion of water contaminated by human or animal faeces or urine containing pathogenic bacteria or viruses; include cholera, typhoid, amoebic and bacillary dysentery and other diarrhoeal diseases.

Water-washed diseases: caused by poor personal hygiene and skin or eye contact with contaminated water; include scabies, trachoma and flea, lice andtick-borne diseases.

Water-based diseases: caused by parasites found in intermediate organisms living in water; include dracunculiasis, schistosomiasis and other helminths.

Water-related diseases: caused by insect vectors which breed in water; include dengue, filariasis, malaria, onchocerciasis, trypanosomiasis and yellow fever.

No single type of intervention has greater overall impact upon the national development and public health than does the provision of safe drinking water and the proper disposal of human excreta. The direct effects of improved water and sanitation services upon health are most clearly seen in

the case of water-related diseases, which arise from the ingestion of pathogens in contaminated water or food and from insects or other vectors associated with water. Improved water and sanitation can reduce morbidity and mortality rates of some of the most serious of these diseases by 20% to 80%. Overall progress in reaching the unserved has been poor since 1990. Approximately one billion people around the world still lack safe water and more than two billion do not have adequate excreta disposal facilities. Rapid population growth and lagging rates of coverage expansion has left more people without access to basic sanitation today than in 1990.

(ENVIS Centre on Hygiene, Sanitation, Sewage Treatment Systems and Technology)

6.1.4 Epidemic Breakages in Camps

The risk for communicable disease transmission after disasters is associated primarily with the size and characteristics of the population displaced, specifically the proximity of safe water and functioning latrines, the nutritional status of the displaced population, the level of immunity to vaccine-preventable diseases such as measles, and the access to healthcare services. Outbreaks are less frequently reported in disaster-affected populations than in conflict-affected populations, where two thirds of deaths may be from communicable diseases. Malnutrition increases the risk for death from communicable diseases and is more common in conflict-affected populations, particularly if their displacement is related to long-term conflict.

Although outbreaks after flooding have been better documented than those after earthquakes, volcanic eruptions, or tsunamis natural disasters (regardless of type) that do not result in population displacement are rarely associated with outbreaks. Historically, the large-scale displacement of populations as a result of natural disasters is not common, which likely contributes to the low risk for outbreaks overall and to the variability in risk among disasters of different types.

Risk Factors for Communicable Disease Transmission

Responding effectively to the needs of the disaster-affected population requires an accurate communicable disease risk assessment. The efficient use of humanitarian funds depends on implementing priority interventions on the basis of this risk assessment.

A systematic and comprehensive evaluation should identify

1) endemic and epidemic diseases that are common in the affected area;

2) living conditions of the affected population, including number, size, location, and density of settlements;

3) availability of safe water and adequate sanitation facilities;

4) underlying nutritional status and immunization coverage among the population; and

5) degree of access to healthcare and to effective case management.

Communicable Diseases Associated with Natural Disasters

The following types of communicable diseases have been associated with populations displaced by natural disasters. These diseases should be considered when postdisaster risk assessments are performed.

Water-related Communicable Diseases

Access to safe water can be jeopardized by a natural disaster. Diarrheal disease outbreaks can occur after drinking water has been contaminated and have been reported after flooding and related displacement. An outbreak of diarrheal disease after flooding in Bangladesh in 2004 involved >17,000 cases; *Vibrio cholerae* (O1 Ogawa and O1 Inaba) and enterotoxigenic *Escherichia coli* were isolated. A large (>16,000 cases) cholera epidemic (O1 Ogawa) in West Bengal in 1998 was attributed to preceding floods, and floods in Mozambique in January–March 2000 led to an increase in the incidence of diarrhea.

In a large study undertaken in Indonesia in 1992–1993, flooding was identified as a significant risk factor for diarrheal illnesses caused by *Salmonella enterica* serotype Paratyphi A (paratyphoid fever). In a separate evaluation of risk factors for infection with *Cryptosporidium parvum* in Indonesia in 2001–2003, case-patients were >4× more likely than controls to have been exposed to flooding.

The risk for diarrheal disease outbreaks following natural disasters is higher in developing countries than in industrialized countries. In Aceh Province, Indonesia, a rapid health assessment in the town of Calang 2 weeks after the December 2004 tsunami found that 100% of the survivors drank from unprotected wells and that 85% of residents reported diarrhea in the previous 2 weeks. In Muzaffarabad, Pakistan, an outbreak of acute watery diarrhea occurred in an unplanned, poorly equipped camp of 1,800 persons after the 2005 earthquake. The outbreak involved >750 cases, mostly in adults, and was controlled after adequate water and sanitation facilities were provided. In the United States, diarrheal illness was noted after Hurricanes Allison and Katrina, and norovirus, *Salmonella*, and toxigenic and nontoxigenic *V. cholerae* were confirmed among Katrina evacuees.

Hepatitis A and E are also transmitted by the fecal-oral route, in association with lack of access to safe water and sanitation. Hepatitis A is endemic in most developing countries, and most children are exposed and develop immunity at an early age. As a result, the risk for large outbreaks is usually low in these settings. In hepatitis E–endemic areas, outbreaks frequently follow heavy rains and floods; the illness is generally mild and

self-limited, but in pregnant women case-fatality rates can reach 25%. After the 2005 earthquake in Pakistan, sporadic hepatitis E cases and clusters were common in areas with poor access to safe water. Over 1,200 cases of acute jaundice, many confirmed as hepatitis E, occurred among the displaced. Clusters of both hepatitis A and hepatitis E were noted in Aceh after the December 2004 tsunami.

Leptospirosis is an epidemic-prone zoonotic bacterial disease that can be transmitted by direct contact with contaminated water. Rodents shed large amounts of leptospires in their urine, and transmission occurs through contact of the skin and mucous membranes with water, damp soil or vegetation (such as sugar cane), or mud contaminated with rodent urine. Flooding facilitates spread of the organism because of the proliferation of rodents and the proximity of rodents to humans on shared high ground. Outbreaks of leptospirosis occurred in Taiwan, Republic of China, associated with Typhoon Nali in 2001; in Mumbai, India, after flooding in 2000; in Argentina after flooding in 1998; and in the Krasnodar region of the Russian Federation in 1997. After a flooding-related outbreak of leptospirosis in Brazil in 1996, spatial analysis indicated that incidence rates of leptospirosis doubled inside the flood-prone areas of Rio de Janeiro.

Other Diseases Associated with Natural Disasters

Tetanus is not transmitted person to person but is caused by a toxin released by the anaerobic tetanus bacillus *Clostridium tetani*. Contaminated wounds, particularly in populations where vaccination coverage levels are low, are associated with illness and death from tetanus. A cluster of 106 cases of tetanus, including 20 deaths, occurred in Aceh and peaked 2-1/2 weeks after the tsunami. Cases were also reported in Pakistan following the 2005 earthquake

An unusual outbreak of coccidiomycosis occurred after the January 1994 Southern California earthquake. The infection is not transmitted person to person and is caused by the fungus *Coccidioides immitis*, which is found in soil in certain semiarid areas of North and South America. This outbreak was associated with exposure to increased levels of airborne dust subsequent to landslides in the aftermath of the earthquake (NCBI, 2007)

6.1.5 Climatic Changes and Seasonal Varitions

For most people, the expression "climate change" means the alteration of the world's climate that we humans are causing, through fossil fuel burning, clearing forests and other practices that increase the concentration of greenhouse gases (GHG) in the atmosphere. This is in line with the official definition by the United Nations Framework Convention on Climate Change (UNFCCC) that climate change is the change that can be attributed "directly or indirectly to human activity that alters the

composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"

Causes of Climatic Change

The Earth's climate has varied considerably in the past, as shown by the geological evidence of ice ages and sea-level changes, and by the records of human history over many hundreds of years. The causes of past changes are not always clear but are generally known to be related to changes in ocean currents, solar activity, volcanic eruptions and other natural factors.

The difference now is that global temperatures have risen unusually rapidly over the last few decades. There is strong evidence of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising average global sea levels. The IPCC Fourth Assessment Report concludes that the global warming is unequivocal. Atmosphere and ocean temperatures are higher than they have been at any other time during at least the past five centuries, and probably for more than a millennium.

Scientists have long known that the atmosphere's greenhouse gases act as a "blanket" which traps incoming solar energy and keeps the Earth's surface warmer than it otherwise would be, and that an increase in atmospheric greenhouse gases would lead to additional warming. The current concentration of greenhouse gases in the atmosphere is now the highest it has been for the past 500,000 years, having grown by 70% between 1970 and 2004 alone, and having reached this level exceptionally quickly.8 While there has been some controversy in the past, it is now widely accepted that human activities, in particular fossil fuel use and changing land-uses, are the dominant factor in this growth and are responsible for most of the warming observed over the past 50 years.

Climatic Changes and Disasters

Natural hazards by themselves do not cause disasters – it is the combination of an exposed, vulnerable and ill-prepared population or community with a hazard event that results in a disaster. Climate change will therefore affect disaster risks in two ways, firstly through the likely increase in weather and climate hazards, and secondly through increases in the vulnerability of communities to natural hazards, particularly through ecosystem degradation, reductions in water and food availability, and changes to livelihoods. Climate change will add yet another stress to those of environmental degradation and rapid unplanned urban growth, further reducing communities' abilities to cope with even the existing levels of weather hazards.

Over the period 1991-2005, 3,470 million people were affected by disasters, 960,000 people died, and economic losses were US$ 1,193 billion. Poor countries are disproportionately affected, owing to intrinsic vulnerabilities to hazards and comparatively low capacities for risk

reduction measures. Small countries are also particularly vulnerable - Grenada's losses of 919 US$ million as a result of Hurricane Ivan in 2004 were equal to 2.5 times its GDP. Over the last two decades (1988-2007), 76% of all disaster events were hydrological, meteorological or climatological in nature; these accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards. The likelihood of increased weather extremes in future therefore gives great concern that the number or scale of weather-related disasters will also increase. There is already evidence of increases in extreme conditions for some weather elements in some regions. The IPCC conclusions on changes in extreme conditions relevant to disaster occurrence are as follows: Many long-term precipitation trends (1900-2005) have been observed, including significant increases in eastern parts of North and South America, Northern Europe and Northern and Central Asia, and more dry conditions in the Sahel and Southern Africa, throughout the Mediterranean region, and in parts of Southern Asia. The frequency of heavy precipitation events has increased over most land areas, which is consistent with global warming and the observed increases of atmospheric water vapour. More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics. Higher temperatures and decreased precipitation have increased the prevalence of drier conditions as well as contributing to changes in the distribution of droughts. Changes in sea surface temperatures, wind patterns, and decreased snow pack and snow cover also have been linked to changing drought occurrence. Widespread changes in extreme temperatures have been observed in many regions of the world over the last 50 years; most notably the higher frequency of high-temperature days and nights and heat. There is good evidence for an increase of the more damaging intense tropical cyclone activity in the North Atlantic since about 1970, which is correlated with increases in tropical sea surface temperatures. However, according to the IPCC, to date there is no clear trend evident in the global annual number of tropical cyclones.

(ISDR Geneva, United Nations, 2008)

6.2 HUMANITARIAN CONCERNS IN RELIEF PROVISION

Humanitarian assistance: towards a right of access to victims of natural disasters

Understand the history of international humanitarian assistance, including the key organizations involved and the principles and laws governing their work

Know the most common causes of morbidity and mortality in populations affected by conflict, disaster and terrorism, and the key assessment strategies and public health interventions to consider

Be familiar with prevention and preparedness approaches to disasters and acts of terrorism, and the roles and limitations of health interventions in conflict mitigation and humanitarian protection

Be able to apply lessons learned to actual cases involving conflict, disaster, displacement, and terrorism

Know where to go for updated information on the field of humanitarian assistance and its practice

A health professional who wishes to make a positive impact in a disastrous situation faces many challenges. To begin with, goals must be defined. Is the aim of humanitarian medical work to reduce death, sickness, and suffering during a period of acute vulnerability? Or does the work extend to promoting the sustainable development of health systems and advancing peace, justice, and the respect of human rights? What if the choice to engage in relief work is motivated by religious, political, or military objectives?

Whether or not the aims of the work are narrowly or broadly defined, practitioners need excellent technical skills in evidence-based medicine and public health to avoid doing more harm than good. They must become rapidly familiar with the particular health problems threatening the population in question and the available resources (structural, financial, human, and organizational) and strategies that exist to cope with them. The most effective aid workers elicit and prioritize the health concerns of those being served: respect, support, learn from, and, when appropriate, guide colleagues; coordinate efforts; maintain flexibility; and strive for equity and efficiency while ensuring that assistance also reaches the most vulnerable populations. These aid workers also dedicate themselves to serving others while taking care to maintain personal health and equanimity in the midst of unfamiliar and stressful situations.

Experienced aid workers realize that their work may put them in danger, and they contribute to individual and group security by respecting sound security protocols, maintaining positive interpersonal relationships (with officials, community members, and colleagues), and collecting and sharing relevant information. In sum, the consummate humanitarian health worker combines compassion, commitment, and integrity with technical proficiency in promoting the delivery of the most appropriate, evidence-based, and up-to-date preventive and curative health services—a tall order in what are often very challenging environments!

The potential dangers, stresses, frustrations, and, at times, monotony of humanitarian work should not be underestimated. Still, far from being a selfless exercise, the rewards of this work are many.

Standard Operation Procedure to deal with trigger mechanism

Trigger Mechanism prescribes the manner in which the disaster response system shall be automatically activated after receiving early warning signals of a disaster happening or likely to happen or on receipt of information of an incident. Activities envisaged in this SOP under the response phase shall be initiated simultaneously without loss of time to minimize the loss and damage and mitigate the impact of disaster

The objective of having a trigger mechanism for natural disasters is to have a suo-motto activation mechanism for spontaneous response to set in motion command, control and management of the situation.

There shall be two types of situation with different trigger mechanisms for natural disasters:

(i) Situation I – Where Early Warning signals are available
(ii) Situation II- Where Disaster occurs without early warning

Where Early Warning signals are available,

- At the National Level Nodal Agencies have been designated by MHA for generating/forecasting of events of natural disasters. Onset of disaster shall be indicated through forecasting by the Nodal Agencies.
- NTDCC, STDCC shall be fully activated and activities envisaged in this SOP under the response phase shall be initiated simultaneously without loss of time to minimize the loss and damage due to impact of likely disaster.
- National and State Control Centers shall be fully activated.
- TSPs shall inform their customers via SMS / Cell Broadcast or recorded voice messages as per instructions of Government in the affected areas.
- TSPs shall keep all the required inventory and personnel in readiness.
- TSPs shall take all pre-emptive measures (based on the nature of warning) as mentioned in this SOP or in any specific instructions/ orders issued by Government and report the same to SDTCC. SDTCC shall compile the details of such measures and report to NDTCC.

Where Disaster occurs without early warning

In disaster situations where no early warning signals are available, the primary objective of the trigger mechanism shall be to mount immediate rescue and relief operations and set the process in as quickly as possible as per this SOP.

The following procedure shall be followed in such situations:

1. State Control Room shall be fully activated for managing the incident.

2. National Control Room shall be informed. First Information Report shall be submitted to National Control Room.

3. DRTF and RDAT teams shall be deployed by TSPs.

6.3 MANAGEMENT OF VOLUNTEERS IN DISASTERS

The management of unaffiliated, often spontaneous, volunteers in times of emergency is guided by the following principles and values:

Volunteering in community life

Volunteering is a valuable part of every healthy community. Volunteers come from all segments of society; everyone has the potential to contribute strength and resources in times of emergency.

The value of affiliation

Ideally, all volunteers should be affiliated with established organizations and trained for specific disaster response activities. However, spontaneous volunteers are inevitable; therefore they must be anticipated, planned for and managed.

Volunteer involvement in the four phases of disasters

There are valuable and appropriate roles for spontaneous unaffiliated volunteers in mitigation, preparedness, response and recovery – as well as in other areas of community need.

Management systems

Volunteers are a valuable resource when they are trained, assigned and supervised within established emergency management systems. An essential element of every emergency management plan is the clear designation of responsibility for the on-site coordination of unaffiliated volunteers.

Shared responsibility

The mobilization, management, and support of volunteers is primarily a responsibility of local government and nonprofit sector agencies, with support from the state level. Specialized planning, information sharing, and a management structure are necessary to coordinate efforts and maximize the benefits of volunteer involvement.

Volunteer expectations

Volunteers are successful participants in emergency management systems when they are flexible, self-sufficient, aware of risks, and willing to be coordinated by local emergency management experts. Volunteers must accept the obligation to "do no harm."

The impact on volunteers

The priority of volunteer activity is assistance to others. When this spontaneous activity is well managed, it also positively affects the volunteers themselves and thus contributes to the healing process of both individuals and the larger community.

Build on existing capacity

All communities include individuals and organizations that know how to mobilize and involve volunteers effectively. Emergency management experts and VOAD partners are encouraged to identify and utilize all existing capacity for integrating unaffiliated volunteers.

Information management

Clear, consistent and timely communication is essential to successful management of unaffiliated volunteers. A variety of opportunities and messages should be utilized in order to educate the public, minimize confusion, and clarify expectations.

Consistent terminology

When referring to volunteers in emergency management, it is helpful to use consistent terminology. The following terms and definitions are recommended:

Affiliated volunteers are attached to a recognized voluntary or nonprofit organization and are trained for specific disaster response activities. Their relationship with the organization precedes the immediate disaster, and they are invited by that organization to become involved in a particular aspect of emergency management.

Unaffiliated volunteers are no part of a recognized voluntary agency and often have no formal training in emergency response. They are not officially invited to become involved but are motivated by a sudden desire to help others in times of trouble. They come with a variety of skills and may come from within the affected area or from outside.
(National and Community Service)

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What is the need for PFA?

ii. What are the PFA Action Principles?

iii. What is the impact on volunteers?

iv. What is the main objective of conducting medical camps?

6.5 LET US SUM UP

This chapter explains the most important need, that is Psychological First Aid, which includes, Health Camps, Relief Center, Water and Sanitation Issues etc. It indicates the need of Humanitarian Concerns in Relief Provision to show our support and solidarity to the affect people. Management of Relief Experts plays a vital role to be concerned of the Volunteers, Materials, Equipment and the Standard Operation Procedure to deal with trigger mechanism is also learnt in this chapter.

6.6 UNIT END EXERCISE

1. Explain the importance of Psychological First Aid and their various camps?
2. What are the effects of Climatic Changes and Seasonal Variations?
3. Write down the Early warning signals
4. Discuss on the various methods in managing the volunteers in disasters
5. What is the need of Humanitarian Concerns in Relief Provision
6. Describe the Standard Operation Procedure to deal with trigger mechanism.

6.7 ANSWER TO CHECK YOUR PROGRESS

i. Need for PFA: People do better over the long term if they Feel safe, connected to others, calm & hopeful. Have access to social, physical & emotional support. Regain a sense of control by being able to help themselves.

ii. PFA Action Principles are Prepare, Look, Listen and Link.

iii. The impact on volunteers: The priority of volunteer activity is assistance to others. When this spontaneous activity is well managed, it also positively affects the volunteers themselves and thus contributes to the healing process of both individuals and the larger community.

iv. Objectives: To identify medical needs of the flood-affected population. To identify problems faced in running a medical relief camp in flood disaster-affected area.

6.8 SUGGESSTED READINGS

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UNIT VII – CRISIS AND EMERGENCY MANAGEMENT

Structure

7.1 GOVERNMENT RESPONSE IN DISASTERS

The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well-established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned.

At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include: India Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defence, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water Resources, Ministry of Petroleum, Department of Agriculture & Cooperation. Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Environment and Forest, Department of Food. Each Ministry/Department/Organization nominate their nodal officer to the Crisis Management Group chaired by Central Relief Commissioner. The nodal officer is responsible for preparing sectoral Action Plan/Emergency Support Function Plan for managing disasters.

National Crisis Management Committee (NCMC)

Cabinet Secretary, who is the highest executive officer, heads the NCMC. Secretaries of all the concerned Ministries /Departments as well as organizations are the members of the Committee. The NCMC gives direction to the Crisis Management Group as deemed necessary. The Secretary, Ministry of Home Affairs is responsible for ensuring that all developments are brought to the notice of the NCMC promptly. The NCMC can give directions to any Ministry/Department/Organization for specific action needed for meeting the crisis situation.

Crisis Management Group

The Central Relief Commissioner in the Ministry of Home Affairs is the Chairman of the CMG, consisting of senior officers (called nodal officers) from various concerned Ministries. The CMG's functions are to review every year contingency plans formulated by various Ministries/ Departments/Organizations in their respective sectors, measures required for dealing with a natural disasters, coordinate the activities of the Central Ministries and the State Governments in relation to disaster preparedness and relief and to obtain information from the nodal officers on measures relating to above. The CMG, in the event of a natural disaster, meets frequently to review the relief operations and extend all possible assistance required by the affected States to overcome the situation effectively. The Resident Commissioner of the affected State is also associated with such meetings.

Control Room (Emergency Operation Room)

An Emergency Operations Center (Control Room) exists in the nodal Ministry of Home Affairs, which functions round the clock, to assist the Central Relief Commissioner in the discharge of his duties. The activities of the Control Room include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected States, interaction with other Central Ministries/Departments/Organizations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries etc., keeping up-to-date details of all concerned officers at the Central and State levels.

Contingency Action Plan

A National Contingency Action Plan (CAP) for dealing with contingencies arising in the wake of natural disasters has been formulated by the Government of India and it had been periodically updated. It facilitates the launching of relief operations without delay. The CAP identifies the initiatives required to be taken by various Central Ministries/Departments in the wake of natural calamities, sets down the procedure and determines the focal points in the administrative machinery.

State Relief Manuals

Each State Government has relief manuals/codes which identify that role of each officer in the State for managing the natural disasters. These are reviewed and updated periodically based on the experience of managing the disasters and the need of the State.

Funding mechanisms

The policy and the funding mechanism for provision of relief assistance to those affected by natural calamities is clearly laid down. These are reviewed by the Finance Commission appointed by the Government of India every five years. The Finance Commission makes recommendation regarding the division of tax and non-tax revenues between the Central and the State Governments and also regarding policy for provision of relief assistance and their share of expenditure thereon. A Calamity Relief Fund (CRF) has been set up in each State as per the recommendations of the Eleventh Finance Commission. The size of the Calamity Relief Fund has been fixed by the Finance Commission after taking into account the expenditure on relief and rehabilitation over the past 10 years. The Government of India contributes 75% of the corpus of the Calamity Relief Fund in each State. 25% is contributed to by the State. Relief assistance to those affected by natural calamities is granted from the CRF. Overall norms for relief assistance are laid down by a national committee with representatives of States as members. Different States can have Statespecific norms to be recommended by State level committee under the Chief Secretary. Where the calamity is of such proportion that the funds available in the CRF will not be sufficient for provision of relief, the State seeks assistance from the National Calamity Contingency Fund (NCCF) - a fund created at the Central Government level. When such requests are received, the requirements are assessed by a team from the Central Governemnt and thereafter the assessed requirements are cleared by a High Level Committee chaired by the Deputy Prime Minister. In brief, the institutional arrangements for response and relief are well established and have proved to be robust and effective.

In the federal set up of India, the basic responsibility for undertaking rescue, relief and rehabilitation measures in the event of a disaster is that of the State Government concerned. At the State level, response, relief and rehabilitation are handled by Departments of Relief & Rehabilitation. The State Crisis Management Committee set up under the Chairmanship of Chief Secretary who is the highest executive functionary in the State. All the concerned Departments and organisations of the State and Central Government Departments located in the State are represented in this Committee. This Committee reviews the action taken for response and relief and gives guidelines/directions as necessary. A control room is established under the Relief Commissioner. The control room is in constant touch with the climate monitoring/forecasting agencies and monitors the action being taken by various agencies in performing their responsibilities. The district level is the key level for disaster management and relief activities. The Collector/Dy. Commissioner is the chief administrator in the district. He is the focal point in the preparation of district plans and in directing, supervising and monitoring calamities for relief. A District Level Coordination and Relief Committee is

constituted and is headed by the Collector as Chairman with participation of all other related government and non governmental agencies and departments in addition to the elected representatives. The Collector is required to maintain close liaison with the district and the State Governments as well as the nearest units of Armed Forces/Central police organisations and other relevant Central Government organisations like Ministries of Communications, Water Resources, Drinking Water, Surface Transport, who could supplement the efforts of the district administration in the rescue and relief operations. The efforts of the Government and non-governmental organisations for response and relief and coordinated by the Collector/Dy. Commissioner. The District Magistrate/Collector and Coordination Committee under him reviews preparedness measures prior to a impending hazard and coordinate response when the hazard strikes. As all the Departments of the State Government and district level report to the Collector, there is an effective coordination mechanism ensuring holistic response.

New institutional mechanisms: As has been made clear above, the existing mechanisms had based on post-disaster relief and rehabilitation and they have proved to be robust and effective mechanisms in addressing these requirements. The changed policy/approach, however, mandates a priority to full disaster aspects of mitigation, prevention and preparedness and new institutional and policy mechanisms are being put in place to address the policy change.

It is proposed to constitute a National Emergency Management Authority at the National level. The High Powered Committee on Disaster Management which was set up in August, 1999 and submitted its Report in October, 2001, had inter 9 alia recommended that a separate Department of Disaster Management be set up in the Government of India. It was, however, felt that conventional Ministries/Departments have the drawback of not being flexible enough specially in terms of the sanction procedures. The organisation at the Apex level will have to be multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority has, therefore, been proposed as a combined Secretariat/Directorate structure – a structure which will be an integral part of the Government and, therefore, will work with the full authority of the Government while, at the same time, retaining the flexibility of a field organisation. The National Emergency Management Authority will be headed by an officer of the rank of Secretary/Special Secretary to the Government in the Ministry of Home Affairs with Special Secretaries/Additional Secretaries from the Ministries/Departments of Health, Water Resources, Environment & Forests, Agriculture, Railways, Atomic Energy, Defence, Chemicals, Science & Technology, Telecommunications, Urban Employment and Poverty Alleviation, Rural Development and India Meteorological Department as Members of the Authority. The Authority would meet as often as required and review the status of warning systems, mitigation measures and disaster preparedness. When a disaster strikes, the Authority will coordinate disaster management activities. The Authority will be responsible for:

- Coordinating/mandating Government's policies for disaster reduction/mitigation.

- Ensuring adequate preparedness at all levels in order to meet disasters.
- Coordinating response to a disaster when it strikes.
- Coordination of post disaster relief and rehabilitation.

The National Emergency Management Authority will have a core permanent secretariat with three divisions – one for Disaster Prevention, Mitigation & Rehabilitation, the other for Preparedness and the third for Human Resource Development.

7.1.1 State, District, Taluk Disaster Management

At the State level, as indicated in para disaster management was being handled by the Departments of Relief & Rehabilitation. As the name suggests, the focus was almost entirely on post-calamity relief. The Government of India is working with the State Governments to convert the Departments of Relief & Rehabilitation into Departments of Disaster Management with an enhanced area of responsibility to include mitigation and preparedness apart from their present responsibilities of relief and rehabilitation. The changeover has already happened in eight State Governments/Union Territory Administrations. The change is under process in other States.

The States have also been asked to set up Disaster Management Authorities under the Chief Minister with Ministers of relevant Departments [Water Resources, Agriculture, Drinking Water Supply, Environment & Forests, Urban Development, Home, Rural Development etc.] as members. The objective of setting up an Authority is to ensure that mitigation and preparedness is seen as the joint responsibility of all the Departments concerned and disaster management concerns are mainstreamed into their programmes. This holistic and multidisciplinary approach is the key to effective mitigation.

At the district level, the District Magistrate who is the chief coordinator will be the focal point for coordinating all activities relating to prevention, mitigation and preparedness apart from his existing responsibilities pertaining to response and relief. The District Coordination and Relief Committee is being reconstituted/re-designated into Disaster Management Committees with officers from relevant departments being added as members. Because of its enhanced mandate of mitigation and prevention, the district heads and departments engaged in development will now be added to the Committee so that mitigation and prevention is mainstreamed into the district plan. The existing system of drawing up preparedness and response plans will continue. There will, however, also be a long term mitigation plan. District Disaster Management Committees have already been constituted in several districts and are in the process of being constituted in the remaining multi-hazard prone districts.

Similarly, we are in the process of creating Block/Taluq Disaster Management Committees in these 169 multi-hazard prone districts in 17 States. At the village level, in 169 multi-hazard prone districts, we are constituting Disaster Management Committees and Disaster Management Teams. Each village will have a Disaster Management Plan. The process of drafting the plan has already begun. The Disaster Management Committee

which draws up the plans consists of elected representatives at the village level, local authorities, Government functionaries including doctors/paramedics of primary health centres located in the village, primary school teachers etc. The plan encompasses prevention, mitigation and preparedness measures. The Disaster Management Teams at the village level will consist of members of voluntary organisations like Nehru Yuvak Kendra and other non-governmental organisations as well as able bodied volunteers from the village. The teams are provided basic training in evacuation, search and rescue etc. The Disaster Management Committee will review the disaster management plan at least once in a year. It would also generate awareness among the people in the village about dos' and don'ts for specific hazards depending on the vulnerability of the village. A large number of village level Disaster Management Committees and Disaster Management Teams have already been constituted.

The States have been advised to enact Disaster Management Acts. These Acts provide for adequate powers for authorities coordinating mitigation preparedness and response as well as for mitigation/prevention measures required to be undertaken. Two States [Gujarat & Madhya Pradesh] have already enacted such a law. Other States are in the process. The State Governments have also been advised to convert their Relief Codes into Disaster Management Codes by including aspects of prevention, mitigation and preparedness.

In order to further institutionalize the new approach, the Government of India have decided to enunciate a National Policy on Disaster Management. A draft policy has accordingly been formulated and is expected to be put in place shortly. The policy shall inform all spheres of Central Government activity and shall take precedence over all existing sectoral policies. The broad objectives of the policy are to minimize the loss of lives and social, private and community assets because of natural or manmade disasters and contribute to sustainable development and better standards of living for all, more specifically for the poor and vulnerable sections by ensuring that the development gains are not lost through natural calamities/disasters.

The policy notes that State Governments are primarily responsible for disaster management including prevention and mitigation, while the Government of India provides assistance where necessary as per the norms laid down from time to time and proposes that this overall framework may continue. However, since response to a disaster requires coordination of resources available across all the Departments of the Government, the policy mandates that the Central Government will, in conjunction with the State Governments, seek to ensure that such a coordination mechanism is laid down through an appropriate chain of command so that mobilization of resources is facilitated.

The broad features of the draft national policy on disaster management are enunciated below:-

(i) A holistic and pro-active approach for prevention, mitigation and preparedness will be adopted for disaster management.
(ii) Each Ministry/Department of the Central/State Government will set apart an appropriate quantum of funds under the Plan for specific

schemes/projects addressing vulnerability reduction and preparedness.

(iii) Where there is a shelf of projects, projects addressing mitigation will be given priority. Mitigation measures shall be built into the on-going schemes/programmes

(iv) Each project in a hazard prone area will have mitigation as an essential term of reference. The project report will include a statement as to how the project addresses vulnerability reduction.

(v) Community involvement and awareness generation, particularly that of the vulnerable segments of population and women has been emphasized as necessary for sustainable disaster risk reduction. This is a critical component of the policy since communities are the first responders to disasters and, therefore, unless they are empowered and made capable of managing disasters, any amount of external support cannot lead to optimal results.

(vi) There will be close interaction with the corporate sector, nongovernmental organisations and the media in the national efforts for disaster prevention/vulnerability reduction.

(vii) Institutional structures/appropriate chain of command will be built up and appropriate training imparted to disaster managers at various levels to ensure coordinated and quick response at all levels; and development of inter-State arrangements for sharing of resources during emergencies.

(viii) A culture of planning and preparedness is to be inculcated at all levels for capacity building measures.

(ix) Standard operating procedures and disaster management plans at state and district levels as well as by relevant central government departments for handling specific disasters will be laid down.

(x) Construction designs must correspond to the requirements as laid down in relevant Indian Standards.

(xi) All lifeline buildings in seismic zones III, IV & V – hospitals, railway stations, airports/airport control towers, fire station buildings, bus stands major administrative centres will need to be evaluated and, if necessary, retro-fitted.

(xii) The existing relief codes in the States will be revised to develop them into disaster management codes/manuals for institutionalizing the planning process with particular attention to mitigation and preparedness.

With the above mentioned institutional mechanism and policy framework in position and the actions taken to implement the policy guidelines, it is expected that the task of moving towards vulnerability reduction will be greatly facilitated. (Ministry of Home affairs - Disaster management in India)

7.2 TRIGGER MECHANISMS

- Key to Ignition
- Spontaneous Response
- Simultaneous Energisation
- Suo Moto Activation
- Block Building
- Command and Control

The Parameters

- Signal/Warning Mechanism
- Activities and their levels
- Sub Activities Defined
- Authorities Specified
- Response Time Determined
- Sub Action Plans Formulated
- Quik response Team
- Alternative Plans
- Appropriate Delgation

Trigger Mechanism

Trigger Mechanism is a quick response mechanism, which would spontaneously set the vehicle of management into motion on the road to disaster mitigation process. The trigger mechanism has been envisaged as a preparedness plan whereby the receipt of a single of an impending disaster would simultaneously energise and activate the mechanism for response and mitigation without loss of crucial time. This would entail all the participating managers to know in advance the task assigned to them and the manner of response. Identification of available resources, including manpower, material and equipment and adequate delegation of financial and administrative powers are prerequisites to successful operation of the trigger mechanism.

As and when a disaster takes place, be it natural or man-made, the managers struggle to mitigate its effects on human lives and material losses. The immediate response in all disasters has more or less the same parameters. These are to provide rescue and relief and save the precious human life. Thus, the emergency response of the disaster managers is a factor independent of the types of intensity of the disasters.

As and when the disasters strike or take place, the managers are required to swing in action without losing time. Generally, in such situations, the managers start organising, planning and activating the mitigation process. On the other hand, the event had already taken place and the need of that hour is to start the mitigation process and virtually no time can be spared at that stage for the activities like organizing and planning. Time is the essence of the immediate relief and rescue operations to save human lives and mitigate human miseries for the next 48 to 72 hours. Thereafter, actually what is required to be done is a part of long term rehabilitation and reconstruction programmes.

The trigger mechanism in fact is a preparedness plan in which all the participating managers, and actors know in advance the task assigned to them and the manner in which they have to be prepared themselves to respond.

In fact the trigger mechanism is in essence the Standard Operating Procedure (SOP) in which the implementation of the efforts on ground is well laid down. Generally, the activities which include evacuation, search and rescue, temporary shelter, food, drinking water, clothing, health and sanitation, communications, accessibility, and public information which are very important components of disaster management, would follow on

the activation of the Trigger Mechanism. All these major activities which are common in all types of disasters will require sub-division and preparation of sub-action plans by each specified authority. They will be required to list all requirements and their availability within the prescribed response time. Separate SOPs need to be in place for each front line agency like Police, Fire Service, PWD, Highways, Health Departments.

The Trigger Mechanism requires the disaster managers to:

- Evolve an effective signal / warning mechanism.
- Identify activities and their levels.
- Identify sub-activities under each activity / level of activity.
- Specify authorities for each level of activity and sub-activity.
- Determine the response time for each activity.
- Work out individual plans of each specified authority to achieve the activation as per the response time.
- Have Quick Response Teams for each specified authority.
- Have alternative plans and contingency measures.
- Provide appropriate administrative and financial delegations to make the response mechanism functionally viable.
- Undergo preparedness drills

Paradigm Shift towards Prevention and Reduction- Recognizing the rapidly rising world-wide toll of human and economic losses due to natural disasters, the UN General Assembly in 1989 took a decision to launch a far reaching global undertaking during the nineties to save human lives and reduce the impact of natural disasters. With this aim in mind, the decade 1990-2000 was declared as the International Decade for Natural Disaster Reduction (IDNDR).

The objective of the IDNDR was to reduce, through concerted international action, especially in developing countries, the loss of life, property damage and social and economic disruption caused by natural disasters such as earthquakes, floods, cyclones, landslides, locust infestations, drought and desertification and other calamities of natural origin.

By the year 2000, as per the plan of the IDNDR, all countries should have had:

Comprehensive national assessments of risks from natural hazards, with these assessments taking into account their impact on developmental plans,

. Mitigation plans at national and/ or local levels, involving long term prevention and preparedness and community awareness, and

Ready access to global, regional, national and local warning systems and widespread dissemination of such warnings

7.3 BIRMS – BASIC INITIAL RESPONSE MANAGEMENT STEPS

India is vulnerable to a variety of natural and man-made disasters that hinder the country’s growth. The management of response in disasters requires the existing administrative set up, civil society and its various institutions to carry out a large number of tasks. The activities involved in response management would depend on the nature and type of disaster. It has been observed that in times of disaster, apart from lack of resources,

lack of coordination among various agencies and an absence of role clarity amongst various stakeholders pose serious challenges. If the response is planned and the stakeholders are trained, there will be no scope for ad-hoc measures and the response will be smooth and effective. The objective of these Guidelines is to pre-designate officers to perform various duties as well as train them in their respective roles.

Realisation of certain shortcomings in response and a desire to address the critical gaps led Government of India (GOI) to look at the world's best practices and in this pursuit a decision was taken to closely look at the Incident Command System (ICS) of US which was identified as one of the global best practices in disaster management by the High Power Committee on disaster management constituted by the Government of India under the chairmanship of Mr. Pant. The journey of looking at ICS, studying it, reflecting upon our system of management of disasters – its strengths & weaknesses and picking up the learning points from ICS, exploring the institutionalization issues, training strategies and actual conduct of trainings, practicing this system by some of these trained officers in their working, conduct of some pilot projects in three states, number of workshops by NDMA throughout the country in course of preparation of guidelines, finalization of Incident Response System (IRS) guidelines, NIDM taking up training programmes and finalization of training manual for IRS etc. has been long but has been a journey of making progress and moving forward continuously.

Check your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What is Trigger Mechanism?

ii. Write about the Central Relief Commissioner?

iii. What are the activities of the Control Room?

iv. Expand BIRMS.

7.4 LET US SUM UP

This chapter deals with the crisis and emergency management. The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well-established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned. It explains the various levels where and how the Government Response System in Disasters from Central to

the Taluk disaster management Cell. The Trigger Mechanisms tell about the levels of Determination of Disaster and finally it touches the Basic Initial Response Management Steps at the time of crisis and emergency.

7.5 UNIT END EXERCISE

1. Explain the Government Response System in Disasters in detail
2. Write a note on Trigger Mechanisms
3. Briefly explain BIRMS.

7.6 ANSWER TO CHECK YOUR PROGRESS

i. Trigger Mechanism is a quick response mechanism, which would spontaneously set the vehicle of management into motion on the road to disaster mitigation process PFA Action Principles are Prepare, Look, Listen and Link.

ii. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/ warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis.

iii. The activities of the Control Room include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected States, interaction with other Central Ministries/Departments/Organizations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries etc., keeping up-to-date details of all concerned officers at the Central and State levels.

iv. BIRMS – Basic Initial Response Management Steps.

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UNIT VIII – COMMUNICATION SYSTEMS DURING DISASTERS

Structure

8.1 HAM

Communication of early warning information

An effective early warning system needs an effective communication system. Early warning communication systems are made of two main components:

- communication infrastructure hardware that must be reliable and robust, especially during the natural disasters; and
- appropriate and effective interactions among the main actors of the early warning process such as the scientific community, stakeholders, decision makers, the public, and the media.

Many communication tools are currently available for warning dissemination such as Short Message Service (SMS) (cellular phone text messaging), email, radio, TV, and web service. Information and communication technology (ICT) is a key element in early warning. ICT plays an important role in disaster communication and dissemination of information to organizations in charge of responding to warnings and to the public during and after a disaster. Redundancy of communication systems is essential for disaster management, while emergency power supplies and back-up systems are critical in order to avoid the collapse of communication systems after disasters occur.

Radio Promotions

Radio is regarded as the primary source of information for survivors in all types of disastrous situations. During many catastrophic situations, radio was the only medium available to the survivors. Transistors were the only source of information for fishermen trapped by cyclones in deep sea. Similarly, the communities living in Katcha areas got first-hand information about the floods in 2010 through radios. Proximity to the affected local community is the most important consideration the media consumer takes into account while choosing a mass medium to get the information and trusting it.

In terms of the immediate impact of a disaster as well as the initial emergency response, disasters are ultimately local phenomena. It is no surprise then that international and national agencies involved in activities related to disaster mitigation and disaster risk reduction have often focused on building the capacities of local communities to deal effectively with natural disasters. Homes, workplaces, playgrounds, and places of worship become the spaces where one can conceptualise the beginning of this work.

It is in this context that participatory media such as community radio, produced and managed by local communities, are proving to be a vital tool in regions which are prone to chronic disasters. Community radio, with its basic philosophy of empowerment of marginalized people, is attuned to any approach to disaster management that focuses on sections of society that are most vulnerable to all kinds of disasters.

There is enough documented evidence about the critical significance of community radio in dealing with disaster risk reduction and disaster management from Asia, especially South and Southeast Asia. There are exciting stories as well from Africa, Australia, South and Latin America, and the Carribbean of how local communities have used their own communication competencies to share information about impending natural disasters, communicate with each other regarding post-disaster relief efforts, and to build resilient communities that adopt practices of sustainable development so that they become less vulnerable to future disasters.

(Unesco Chair on Community Media, 2013)

SMS

SMS weather alerts play an important role during disasters. According to FEMA, about 60% of Americans don't have a plan of action for an emergency, despite the fact that 80% of the population lives in areas affected by severe weather. Most people don't think about planning for a natural disaster until it's too late. SMS emergency alerts can prevent this from happening. These alerts ensure that friends and family aren't left in the dark during emergencies.

Knowledge is power, as they say. In the event of a crisis or disaster, knowing who to call and what to do can keep everyone safe from harm.

The Benefits of SMS Emergency Alerts

Every disaster is different and there are many steps that people should always take to stay safe – and staying informed is one of them.

Communication doesn't have to be proactive. People only need to know what's going on and what to do in case things gets worse. Businesses and government agencies can provide this information by using SMS emergency alerts.

Most emergency services prefer to use SMS to send out weather text alerts and status updates. Mobile devices are often faster and more reliable than radio and TV stations. They work even when cable or power is out. And, people can use them to receive and share text message alerts with their contact list.

Setting up an emergency alert system allows for better communication during a disaster. People can use the system to stay in touch with authorities, while organizations can reach out to people in any location in the country.

Users also get the added benefit of being able to choose which people to contact during an emergency. By using a smartphone, they can share **weather alerts text messages** with their contacts—it only takes a matter of seconds to do so—and they can choose to record or type the information they need to send.

Sources for SMS Weather Alerts

The National Weather Service (NWS) doesn't provide direct text alerts to the public. But, they do share information on NOAA Weather Radio, Weather. gov, and iNWS service. Third-party sources, then, send weather alerts through SMS, email, and other channels.

(Alexa Lemzy, 2018)

Mobile Services

To better serve the needs of people affected by disasters, humanitarian organizations must be able to make use of new technologies, having the mobile nature of operations, there is an increasing need to enable humanitarian staff with tools and information that they can access on-the-go. In addition, staff and volunteers need to be equipped with tools to access real-time information on disasters, even before they hit.

Moreover, Mobile technology can become a core tool in effective emergency response, and address some of the world's most pressing humanitarian challenges, by providing instant communications and fundraising support over our networks.

Mobile technology could be used before, during and after the disaster strike, since it provides an early warning system, aids in emergency coordination, and improves public communications. Fortunately solutions needless to be complicated; simple text services can have a huge impact in sharing information and re-connecting families.

Mobile Technology for Disaster Preparedness:

The mobile uses for disaster preparedness range from the common uses of raising public awareness and reaching to vulnerable population about disaster risks and preparedness or dissemination early warnings of impending danger to developing community-specific and country-specific parameters in designing and implementing mobile-enabled awareness and preparedness programs or engaging in protective behaviors such as obtaining information about location and availability of preparedness services.

As the Global Disaster Preparedness Center (GDPC) is promoting creative uses of technology and innovative approaches in disaster preparedness programs. The GDPC has created a platform to facilitate the adaptation and localization of mobile applications, through the **Universal App Program**, which provides **first aid** and **hazard** information for use in countries across the globe.

Mobile Data Collection

At this time many RC/RC National Societies, ICRC and IFRC are widely using mobile devices to collect data on a global scale. Many projects have successfully reduced the costs of data collection by a factor of ten and the time to gather and analyze data from up to twelve months to less than two weeks!

There are number of tools used by National Societies for data collection such as:

- **ODK – Open Data Kit**: An open-source suite of tools that helps organizations author, field, and manage mobile data collection solutions. The goal is to make open-source and standards-based tools which are easy to try, easy to use, easy to modify and easy to scale.

- **Magpi** – An easy to use data collection application for field data collection needs. The new version includes advanced features such as the Text to Speech functionality, sub-form integrations, automatic device synchronization, as well as scheduled broadcast messages. The application works on various mobile platforms, and data collection with SMS and web-based entry can be integrated

- **UReport** – A free opt-in, SMS-based system where individuals communicate experience and interest and receive information and access to a web-based dashboard of aggregated data and analysis.

- **MPharma** - A mobile app for managing pharmaceutical prescriptions and consumption in developing countries and is helping to create an end-to-end health information system. MPharma can adapted. (Global Disaster preparedness center)

Satellite Communications

Science has given us many useful tools of communication through which we can communicate in our society or surroundings with easy and effective way. Satellite is one of effective tool of communication in modern world. The development of satellite is one of the latest technologies invented by man in the telecommunication sector. Satellite Communication is a method of communication between terminals to their terrestrial networks. The satellite has it scope of coverage, global, regional, or national.

The "Sputnik 1" was the first satellite in space launched by The Soviet Union in 1957. If we look into the history of Satellite in world, National Aeronautics and Space Administration (NASA) have launched dozens of satellites into space, starting with the Explorer 1 satellite in 1958. Explorer 1 was America's first man-made satellite. NASA was started in 1958 as a part of the United States government. NASA is in charge of U.S. science and technology that has to do with airplanes or space. The first satellite picture of Earth came from NASA's Explorer 6 in 1959. TIROS-1 followed in 1960 with the first TV picture of Earth from space. These pictures did not show much detail. But they did show the potential satellites had to change how people view Earth and space.

According to NASA, a satellite is a moon, planet or machine that orbits a planet or star. For example, Earth is a satellite because it orbits the sun. In the same way, the moon is a satellite because it orbits Earth. Usually, the

word "satellite" refers to a machine that is launched into space and moves around Earth or another body in space.

The impact of satellite technology can be felt in our every day's life, especially in the new world of mass communication where people seek information about the happenings around the globe. The wireless technology often called Wi-Fi an abbreviation of wireless fidelity are some of the new technology that are emerging to allow the user access any technology in any location without wires, this simple means that you can watch movies, listen to radio, read newspaper and magazine, e-books, etc; on your portable computer, a device you can easily carry and pocket it, this is to say that you and your mass media are totally mobile.

Earth and the moon are also the best examples of natural satellites in the world. Thousands of artificial or man-made satellites orbit Earth. Some take pictures of the planet that help meteorologists predict weather and track hurricanes. Some take pictures of other planets, the sun, black holes, dark matter or faraway galaxies. These pictures help scientists better understand the solar system and universe in an effective way. Still other satellites are used mainly for communications such as beaming Television signals and phone calls around the world. A group of more than 20 satellites make up the Global Positioning System (GPS). If you have a GPS receiver, these satellites can help figure out your exact location. Besides this Satellite play an important role in forecasting of weather, hurricanes, typhoons, tide and many types of disaster. Through Satellite, we can handle the disaster related situations in a proper way and save mankind.

Satellite Communication and Disaster Management

India is one of the most disaster prone countries in the world with increasing vulnerability to cyclones, floods, landslides, droughts and earthquakes. The Disaster Management Support (DMS) Programme of ISRO, provides timely support and services from aero-space systems, both imaging and communications, towards efficient management of disasters in the country.

Remote sensing has enabled mapping, studying, monitoring and management of various resources like agriculture, forestry, geology, water, ocean etc. It has further enabled monitoring of environment and thereby helping in conservation. In the last four decades it has grown as a major tool for collecting information on almost every aspect on the earth. With the availability of very high spatial resolution satellites in the recent years, the applications have multiplied. In India remote sensing has been used for

various applications during the last four decades and has contributed significantly towards development.

India has its own satellites like Indian Remote Sensing Satellite (IRS) series – Resourcesat, Cartosat, Oceansat etc which provide required data for carrying out various projects. Some of the important projects carried out in the country include Groundwater Prospects Mapping under Drinking Water Mission, Forecasting Agricultural output using Space, Agro-meteorology and Land based observations (FASAL), Forest Cover/Type Mapping, Grassland Mapping, Biodiversity Characterization, Snow & Glacier Studies, Land Use/Cover mapping, Coastal Studies, Coral and Mangroves Studies, Wasteland Mapping etc. The information generated by large number of projects have been used by various departments, industries and others for different purposes like development planning, monitoring, conservation etc.

The Satellite Communication play an important role in counseling process, counseling seen as a social process in which many social agents are involved. These include the organizers of social life and other society members: potential advice recipients, counselors, researchers. In the industrial era, intentions at the foundation of counseling were different from those the agents of social life have now in the satellite communication era and the network society era. The author analyses this change in its broad context, emphasizing endeavors to elaborate an anthropological theory of counseling and its role in solving global problems.

In conclusion it can be said that Satellite Communication play an important role in rural development and disaster management yet there is a great need of awareness of Satellite Communication tools among general population so that they may use this technology effectively and properly to cope with issues related to disaster and manage themselves.
(Dr. Ravindra Kumar, 2016)

8.2 WARNING SYSTEM IN DISASTERS

The term 'early warning' is used in many fields to describe the provision of information on an emerging dangerous circumstances where that information can enable action in advance to reduce the risks involved. Early warning systems exist for natural geophysical and biological hazards, complex socio-political emergencies, industrial hazards, personal health risks and many other related hazards

An Early Warning System (EWS) can be defined as a set of capacities needed to generate and disseminate timely and meaningful warning information of the possible extreme events or disasters (e.g. floods, drought, fire, earthquake and tsunamis) that threatens people‘s lives. The purpose of this information is to enable individuals, communities and organizations threatened to prepare and act appropriately and in sufficient time to reduce the possibility of harm, loss or risk

Elements of Early warning

Early warning is the integration of four main elements:

1) Risk Knowledge: Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.
2) Monitoring and Predicting: Systems with monitoring and predicting capabilities provide timely estimates of the potential risk faced by communities, economies and the environment.
3) Disseminating Information: Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, synthetic and simple to be understood by authorities and public.
4) Response: Coordination, good governance and appropriate action plans are a key point in effective early warning. Likewise, public awareness and education are critical aspects of disaster mitigation.

The purpose of early warning systems is to detect, forecast, and when necessary, issue alerts related to impending hazard events4 . In order to fulfill a risk reduction function, however, early warning needs to be supported by information about the actual and potential risks that a hazard poses, as well as the measures people can take to prepare for and mitigate its adverse impacts. Early warning information needs to be communicated in people friendly manner in such a way that facilitates decision-making and timely action of response organizations and vulnerable groups. Early warning information comes from different meteorological offices (for weather related disasters- flood, cyclone etc.); Ministries of Health (for example, disease outbreaks) and Agriculture (for example, crop forecasts); local and indigenous sources; media sources and increasingly from Internet early warning services.

Need of Early Warning System:

Early Warning for disaster reduction is a legitimate matter of public policy at the highest national levels for two main reasons:

- The first one, clearly, is public safety, and the protection of human lives.
- The second is the protection of the nation's resource base and productive assets (infrastructure and private property or investments) to ensure long term development and economic growth. Conversely, by reducing the impact of disasters, a government avoids the financial –and political- burden of massive rehabilitation costs.

Investing in early warning and other measures of disaster reduction is neither simple nor inexpensive, but the benefits of doing so, and the costs of failing to, are considerable. For instance:

- In terms of reducing economic losses, early warning and disaster preparedness ‗pay for themselves' many times over the life of the warning system.
- The reduction of environmental losses can, if properly managed and publicized, have both long-term benefits to the economy, and short-term benefits for the administration in-charge.
- A country can strengthen its stature and influence in international relations by a good handling of ‗externalities', or indirect effects, on neighboring nations.

From a public policy viewpoint, early warning, disaster preparedness and prevention must be part of a single, well integrated process.

Community Based Early Warning System

Early warning systems have limitations in terms of saving lives if they are not combined with people-centered‖ networks. To be effective, early warning systems must be understandable, trusted by and relevant to the communities that they serve. Warnings will have little value unless they reach the people most at risk, who need to be trained to respond appropriately to an approaching hazard.

Community-Based Early Warning Systems (CBEWS) are anchored in the communities and managed by the communities. It is based on a "people-centered" approach that empowers individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner in a bid to reduce the possibility of personal injury, loss of life, damage to property, environment and loss of livelihood. It provides communities, practitioners and organizations involved in disaster risk management with advance information of risks that can be readily translated into prevention, preparedness and response actions. CBEWS helps to reduce economic losses by allowing people to better protect their assets and livelihood. Essential features of community-based early warning systems are:

- All community members especially the vulnerable groups should be involved at all stages of the CBEWS from designing to

operating the systems, receiving the warning messages and responding to the warning.

- Measures taken should be based on the needs of everyone in the community including the most vulnerable segments of the community.
- The community members will own the process and system.
- CBEWS measures will enhance the capacity of the community members to deal with their situation.
- Meaningful participation in the decision-making process of EWS

Early warning systems and policy

For early warning systems to be effective, it is essential that they be integrated into policies for disaster mitigation. Good governance priorities include protecting the public from disasters through the implementation of disaster risk reduction policies. It is clear that natural phenomena cannot be prevented, but their human, socio-economic and environmental impacts can and should be minimized through appropriate measures, including risk and vulnerability reduction strategies, early warning, and appropriate action plans. Most often, these problems are given attention during or immediately after a disaster. Disaster risk reduction measures require long term plans and early warning should be seen as a strategy to effectively reduce the growing vulnerability of communities and assets.

The information provided by early warning systems enables authorities and institutions at various levels to immediately and effectively respond to a disaster. It is crucial that local government, local institutions, and communities be involved in the entire policy making process, so they are fully aware and prepared to respond with short and long-term action plans

Key elements for successful implementation of early warning:

1) **Understand the most likely threats, likelihood of disasters and their potential consequences**

Although natural disasters are not precisely predictable, they are most often generally foreseeable. In other words, there are many areas where the occurrence of floods is likely; one does not necessarily know exactly when, but one knows they will occur sooner or later. Many natural hazards can be foreseen, or anticipated, from past experience, the analysis of current patterns of land use, or population distribution.

2) **Establish proper priorities**

To allocate scarce resources most wisely, decision makers must rely on the type of analysis above, and make the disaster management choices which have the highest value', in terms of losses avoided. One common approach is to use the expected value criteria; that is, the likelihood of an event

multiplied by the potential cost of this event if it occurred. Simply stated, it is a matter of giving priority to the _worst-most likely‘ over the _most benign-least likely‘ events.

3) Developing institutional networks with clear responsibilities

Understanding the nature of natural hazards and related vulnerabilities, for early warning purposes, requires a combination of actors from several areas, such as science and research (including social sciences and cultural aspects), land use planning, environment, finance, development, education, health, energy, communications, transportation, labor and social security as well as national defence. On the other hand, a prompt and effective response to a disaster, based on early warning, implies that concerted action –managed by a higher authority—be taken by specific types of institutions: civil defence or public safety personnel, power and other utility agencies or companies, public health authorities, etc. at levels ranging from the cabinet minister’s to the community leaders.

4) Establish or strengthen the legislative/legal framework and mechanisms

Just as for any other aspect of public policy, early warning systems, as well as other disaster reduction applications need to be motivated and based within governmental responsibilities, especially since response to disasters may require exceptional executive powers for a specific period of time but its success cannot be accomplished without the benefits of widespread decision making and the participation of many others

5) Developing effective communication strategies

The context of early warning system communications has two aspects; the hardware aspect relates to the maintenance of lifelines, i.e. the necessity to build or strengthen robust hazard-resistant communication systems; the software aspect relates to the maintenance of relationships, i.e. the need to establish and maintain effective links and working relationships among the actors involved in the early warning communication chain.

6) Securing resources

A substantial amount of resources is needed to ensure monitoring, adequate early warning, concerted disaster reduction, and a return to normal life. To a great extent, the capacity to secure resources to do this versus undertaking a competing public program—depends on the quality and credibility of the overall system: understanding threats, clear priority setting and institutional networks, and appropriate legislative dialogue.

Check your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. Which is the source of information for fishermen trapped by cyclones in deep sea?

ii. What is the use of Mobile technology?

iii. What is MPharma?

8.3 LET US SUM UP

This chapter is about the communication system during disaster. There is a need for **Communication of early warning information.** An effective early warning system needs an effective communication system. So the communication tools that are currently available for warning dissemination and the key elements for successful implementation of early warning being touched in this chapter.

8.4 UNIT END EXERCISE

1. Explain about the communication tools that are currently available for warning dissemination.
2. What are the Elements of Early warnings?

8.5 ANSWER TO CHECK YOUR PROGRESS

i. Transistors were the only source of information for fishermen trapped by cyclones in deep sea.
ii. Mobile technology can become a core tool in effective emergency response, and address some of the world's most pressing humanitarian challenges, by providing instant communications and fundraising support over our networks. Mobile technology could be used before, during and after the disaster strike, since it provides an early warning system, aids in emergency coordination, and improves public communications
iii. **MPharma** - A mobile app for managing pharmaceutical prescriptions and consumption in developing countries and is helping to create an end-to-end health information system

8.6 SUGGESSTED READINGS

Carter, W. Nick, 1991. Disaster Management: A Disaster Manager's Handbook, Asian Development Bank, Manila.

Department of Agriculture and Cooperation, 2001.National Disaster Response Plan : A Document prepared by the High Powered Committee

on Disaster Management, Ministry of Agriculture, Govt. of India, New Delhi.

Ministry of Home Affairs has prepared a Compendium of Instructions on Civil Defence and Handbooks.

UNIT IX – IMPACTS

Structure

9.1 IMPACTS

9.1.1 Impact on Physical

Disaster impacts comprise physical and social impact. The physical impacts of disasters include casualties (deaths and injuries) and property damage, and both vary substantially across hazard agents. The physical impacts of a disaster are usually the most obvious, easily measured, and first reported by the news media. Social impacts, which include psychosocial, demographic, economic, and political impacts, can develop over a long period of time and can be difficult to assess when they occur. Despite the difficulty in measuring these social impacts, it is nonetheless important to monitor them, and even to predict them if possible, because they can cause significant problems for the long-term functioning of specific types of households and businesses in an affected community. A better understanding of disasters' social impacts can provide a basis for pre impact prediction and the development of contingency plans to prevent adverse consequences from occurring.

Physical Impacts

Casualties. According to Noji (1997b), hurricanes produced 16 of the 65 greatest disasters of the 20th Century (in terms of deaths) and the greatest number of deaths from 1947-1980 (499,000). Earthquakes produced 28 of the greatest disasters and 450,000 deaths, whereas floods produced four of the greatest disasters and 194,000 deaths. Other significant natural disasters include volcanic eruptions with nine of the greatest disasters and 9,000 deaths, landslides with four of the greatest disasters and 5,000

deaths, and tsunamis with three of the greatest disasters and 5,000 deaths. There is significant variation by country, with developing countries in Asia, Africa, and South America accounting for the top 20 positions in terms of number of deaths from 1966-1990. Low-income countries suffer approximately 3,000 deaths per disaster, whereas the corresponding figure for high-income countries is approximately 500 deaths per disaster. Moreover, these disparities appear to be increasing because the average annual death toll in developed countries declined by at least 75% between 1960 and 1990, but the same time period saw increases of over 400% in developing countries (Berke, 1995).

There often are difficulties in determining how many of the deaths and injuries are "caused by" a disaster. In some cases it is impossible to determine how many persons are missing and, if so, whether this is due to death or unrecorded relocation. The size of the error in estimates of disaster death tolls can be seen in the fact that for many of the most catastrophic events the number of deaths is rounded to the nearest thousand and some even are rounded to the nearest ten thousand (Noji, 1997b). Estimates of injuries are similarly problematic (see Langness, 1994; Peek-Asa, et al., 1998; Shoaf, et al., 1998, regarding conflicting estimates of deaths and injuries attributable to the Northridge earthquake). Even when bodies can be counted, there are problems because disaster impact may be only a contributing factor to casualties with pre-existing health conditions. Moreover, some casualties are indirect consequences of the hazard agent as, for example, with casualties caused by structural fires following earthquakes (e.g., burns) and destruction of infrastructure (e.g., illnesses from contaminated water supplies).

Damage. Losses of structures, animals, and crops also are important measures of physical impacts, and these are rising exponentially in the United States (Mileti, 1999). However, the rate of increase is even greater in developing countries such as India and Kenya (Berke, 1995). Such losses usually result from physical damage or destruction of property, but they also can be caused by losses of land use to chemical or radiological contamination or loss of the land itself to subsidence or erosion. Damage to the built environment can be classified broadly as affecting residential, commercial, industrial, infrastructure, or community services sectors. Moreover, damage within each of these sectors can be divided into damage to structures and damage to contents. It usually is the case that damage to contents results from collapsing structures (e.g., hurricane winds failing the building envelope and allowing rain to destroy the furniture inside the building). Because collapsing buildings are a major cause of casualties as well, this suggests that strengthening the structure will protect the contents and occupants. However, some hazard agents can damage building contents without affecting the structure itself (e.g., earthquakes striking seismically-resistant buildings whose contents are not securely fastened). Thus, risk area residents may need to adopt additional hazard adjustments

to protect contents and occupants even if they already have structural protection.

Perhaps the most significant structural impact of a disaster on a stricken community is the destruction of households' dwellings. Such an event initiates what can be a very long process of disaster recovery for some population segments. According to Quarantelli (1982a), people typically pass through four stages of housing recovery following a disaster. The first stage is *emergency shelter*, which consists of unplanned and spontaneously sought locations that are intended only to provide protection from the elements, typically open yards and cars after earthquakes (Bolin & Stanford, 1991, 1998). The next step is *temporary shelter*, which includes food preparation and sleeping facilities that usually are sought from friends and relatives or are found in commercial lodging, although "mass care" facilities in school gymnasiums or church auditoriums are acceptable as a last resort. The third step is *temporary housing*, which allows victims to re-establish household routines in non-preferred locations or structures. The last step is *permanent housing*, which re-establishes household routines in preferred locations and structures.

Households vary in the progression and duration of each type of housing and the transition from one stage to another can be delayed unpredictably, as when it took nine days for shelter occupancy to peak after the Whittier Narrows earthquake (Bolin, 1993). Particularly significant are the problems faced by lower income households, which tend to be headed disproportionately by females and racial/ethnic minorities. Such households are more likely to experience destruction of their homes because of pre-impact locational vulnerability. This is especially true in developing countries such as Guatemala (Peacock, Killian & Bates, 1987), but also has been reported in the US (Peacock & Girard, 1997). The homes of these households also are more likely to be destroyed because the structures were built according to older, less stringent building codes, used lower quality construction materials and methods, and were less well maintained (Bolin & Bolton, 1986). Because lower income households have fewer resources on which to draw for recovery, they also take longer to transition through the stages of housing, sometimes remaining for extended periods of time in severely damaged homes (Girard & Peacock, 1997). In other cases, they are forced to accept as permanent what originally was intended as temporary housing (Peacock, et al., 1987). Consequently, there may still be low-income households in temporary sheltering and temporary housing even after high-income households all have relocated to permanent housing (Berke, et al., 1993; Rubin, Sapperstein & Barbee, 1985).

As is the case with estimates of casualties, estimates of losses to the built environment are prone to error. Damage estimates are most accurate when trained damage assessors enter each building to assess the percent of damage to each of the major structural systems (e.g., roof, walls, floors)

and the percentage reduction in market valuation due to the damage. Early approximate estimates are obtained by conducting "windshield surveys" in which trained damage assessors drive through the impact area and estimate the extent of damage that is visible from the street, or by conducting computer analyses using HAZUS (National Institute of Building Sciences, 1998). These early approximate estimates are especially important in major disasters because detailed assessments are not needed in the early stages of disaster recovery and the time required to conduct them on a large number of damaged structures using a limited number of qualified inspectors would unnecessarily delay the community recovery process.

Other important physical impacts include damage or contamination to cropland, rangeland, and woodlands. Such impacts may be well understood for some hazard agents but not others. For example, ashfall from the 1980 Mt. St. Helens eruption was initially expected to devastate crops and livestock in downwind areas, but no significant losses materialized (Warrick, et al., 1981). There also is concern about damage or contamination to the natural environment (wild lands) because these areas serve valuable functions such as damping the extremes of river discharge and providing habitat for wildlife. In part, concern arises from the potential for indirect consequences such as increased runoff and silting of downstream river beds, but many people also are concerned about the natural environment simply because they value it for its own sake.

9.1.2 Impact on Social

For many years, research on the social impacts of disasters consisted of an accumulation of case studies, but two research teams conducted comprehensive statistical analyses of extensive databases to assess the long-term effects of disasters on stricken communities (Friesma, et al., 1979; Wright, et al., 1979). The more comprehensive Wright, et al. (1979) study used census data from the 1960 (preimpact) and 1970 (post-impact) censuses to assess the effects of all recorded disasters in the United States. The authors concurred with earlier findings by Friesma, et al. (1979) in concluding no long-term social impact of disasters could be detected at the community level. In discussing their findings, the authors acknowledged their results were dominated by the types of disasters occurring most frequently in the United States—tornadoes, floods, and hurricanes. Moreover, most of the disasters they studied had a relatively small scope of impact and thus caused only minimal disruption to their communities even in the short term. Finally, they noted their findings did not preclude the possibility of significant long-term impacts upon lower levels such as the neighborhood, business, and household.

Nonetheless, their findings called attention to the importance of the *impact ratio*—the amount of damage divided by the amount of community resources—in understanding disaster impacts. They hypothesized long-term social impacts tend to be minimal in the US because most hazard agents have a relatively small scope of impact and tend to strike

undeveloped areas more frequently than intensely developed areas simply because there are more of the former than the latter. Thus, the numerator of the impact ratio tends to be low and local resources are sufficient to prevent long-term effects from occurring. Even when a disaster has a large scope of impact and strikes a large developed area (causing a large impact ratio in the short term), state and federal agencies and NGOs (e.g., American Red Cross) direct recovery resources to the affected area, thus preventing long-term impacts from occurring. For example, Hurricane Andrew inflicted $26.5 billion in losses to the Miami area, but this was only 0.4% of the US GDP (Charvériat, 2000). Recovery problems described in the studies reported in Peacock, Morrow and Gladwin (1997) were determined more by organizational impediments than by the lack of resources.

9.1.3 Impact on Economic

The property damage caused by disaster impact creates losses in asset values that can be measured by the cost of repair or replacement (Committee on Assessing the Costs of Natural Disasters, 1999). Disaster losses in United States are initially borne by the affected households, businesses, and local government agencies whose property is damaged or destroyed. However, some of these losses are redistributed during the disaster recovery process. There have been many attempts to estimate the magnitude of direct losses from individual disasters and the annual average losses from particular types of hazards (e.g., Mileti, 1999). Unfortunately, these losses are difficult to determine precisely because there is no organization that tracks all of the relevant data and some data are not recorded at all (Charvériat, 2000; Committee on Assessing the Costs of Natural Disasters, 1999). For insured property, the insurers record the amount of the deductible and the reimbursed loss, but uninsured losses are not recorded so they must be estimated—often with questionable accuracy.

The ultimate economic impact of a disaster depends upon the disposition of the damaged assets. Some of these assets are not replaced, so their loss causes a reduction in consumption (and, thus, a decrease in the quality of life) or a reduction in investment (and, thus, a decrease in economic productivity). Other assets are replaced—either through in-kind donations (e.g., food and clothing) or commercial purchases. In the latter case, the cost of replacement must come from some source of recovery funding, which generally can be characterized as either intertemporal transfers (to the present time from past savings or future loan payments) or interpersonal transfers (from one group to another at a given time). Some of the specific mechanisms for financing recovery include obtaining tax deductions or deferrals, unemployment benefits, loans (paying back the principal at low- or no-interest), grants (requiring no return of principal), insurance payoffs, or additional employment. Other sources include depleting cash financial assets (e.g., savings accounts), selling tangible assets, or migrating to an area with available housing, employment, or less risk (in some cases this is done by the principal wage earner only).

In addition to direct economic losses, there are indirect losses that arise from the interdependence of community subunits. Research on the

economic impacts of disasters (Alesch, et al., 1993; Dacy & Kunreuther, 1969; Dalhamer & D'Sousa, 1997; Durkin, 1984; Gordon, et al., 1995; Kroll, et al., 1991; Lindell & Perry, 1998; Nigg, 1995; Tierney, 1997a) suggests the relationships among the social units within a community can be described as a state of dynamic equilibrium involving a steady flow of resources, especially money. Specifically, a household's linkages with the community are defined by the money it must pay for products, services, and infrastructure support. This money is obtained from the wages that employers pay for the household's labor. Similarly, the linkages that a business has with the community are defined by the money it provides to its employees, suppliers, and infrastructure in exchange for inputs such as labor, materials and services, and electric power, fuel, water/wastewater, telecommunications, and transportation. Conversely, it provides products or services to customers in exchange for the money it uses to pay for its inputs.

It also is important to recognize the financial impacts of recovery (in addition to the financial impacts of emergency response) on local government. Costs must be incurred for tasks such as damage assessment, emergency demolition, debris removal, infrastructure restoration, and re-planning stricken areas. In addition to these costs, there are decreased revenues due to loss or deferral of sales taxes, business taxes, property taxes, personal income taxes, and user fees.

9.1.4 Psychological Impact of Disasters

Research reviews conducted over a period of 25 years have concluded that disasters can cause a wide range of negative psychological responses (Bolin 1985; Gerrity & Flynn, 1997; Houts, Cleary & Hu, 1988; Perry & Lindell, 1978). These include psychophysiological effects such as fatigue, gastrointestinal upset, and tics, as well as cognitive signs such as confusion, impaired concentration, and attention deficits. Psychological impacts include emotional signs such as anxiety, depression, and grief. They also include behavioral effects such as sleep and appetite changes, ritualistic behavior, and substance abuse. In most cases, the observed effects are mild and transitory—the result of "normal people, responding normally, to a very abnormal situation" (Gerrity & Flynn 1997, p. 108). Few disaster victims require psychiatric diagnosis and most benefit more from a *crisis counseling* orientation than from a *mental health treatment* orientation, especially if their normal social support networks of friends, relatives, neighbors, and coworkers remain largely intact. However, there are population segments requiring special attention and active outreach. These include children, frail elderly, people with pre-existing mental illness, racial and ethnic minorities, and families of those who have died in the disaster. Emergency workers also need attention because they often work long hours without rest, have witnessed horrific sights, and are members of organizations in which discussion of emotional issues may be regarded as a sign of weakness (Rubin, 1991). However, as Chapter 11 will indicate, there is little evidence of emergency workers needing directive therapies either.

The negative psychological impacts described above, which Lazarus and Folkman (1984) call *emotion focused coping*, generally disrupt the social functioning of only a very small portion of the victim population. Instead, the majority of disaster victims engage in adaptive *problem focused coping* activities to save their own lives and those of their closest associates. Further, there is an increased incidence in prosocial behaviors such as donating material aid and a decreased incidence of antisocial behaviors such as crime (Drabek, 1986; Mileti, et al., 1975; Siegel, et al., 1999). In some cases, people even engage in altruistic behaviors that risk their own lives to save the lives of others (Tierney, et al., 2001).

There also are psychological impacts with long-term adaptive consequences, such as changes in risk perception (beliefs in the likelihood of the occurrence a disaster and its personal consequences for the individual) and increased hazard intrusiveness (frequency of thought and discussion about a hazard). In turn, these beliefs can affect risk area residents' adoption of household hazard adjustments that reduce their vulnerability to future disasters. However, these cognitive impacts of disaster experience do not appear to be large in aggregate, resulting in modest effects on household hazard adjustment (see Lindell & Perry, 2000 for a review of the literature on seismic hazard adjustment, and Lindell & Prater 2000; Lindell & Whitney, 2000; and Whitney, Lindell & Nguyen, 2004 for more recent empirical research).

9.1.5 Impact on Individual

At the individual level, the impact can often be felt physically, mentally and emotionally. Natural disasters cause destruction of property, loss of financial resources, and personal injury or illness. The loss of resources, security and access to shelter can lead to massive population migrations in lesser-developed countries

After experiencing a natural disaster, many individuals develop severe post-traumatic stress disorders or withdraw into states of depression. Others develop negative associations with the environment, in more developed nations; this can also lead to significant population migrations.

9.1.6 Impact on Family

Family relationships after a disaster

- It's normal for families to have difficulties after a disaster. Sometimes it might not be clear how problems are connected with the disaster, especially if they emerge long after the event.
- Most families can become stronger following a crisis, but first you need to understand and deal with any issues.

- Below are some common reactions a family may experience after a disaster. They can be immediate, or happen in the medium term or long term.

Immediate effects

Some reactions may happen immediately after the disaster and continue for a few weeks.

- Afraid for each other's safety away from home.
- Nightmares or fear that another disaster will occur.
- Anger about the fear and distress the disaster has caused. Sometimes this is directed at another family member or at people outside the family.
- Loss of trust and confidence in themselves and other people.
- Emotional turmoil, anger, guilt, sadness, unpredictable behaviour or unreasonable reactions.
- Insecurity in children shown through behaviour such as bed wetting, changes in eating and sleeping habits or reverting to behaviour they have outgrown.
- Difficulty communicating because family members don't know what to say to each other or don't feel like talking.

Medium term effects

Changes which are not obviously related to the disaster can happen weeks or months after the event.

- Spouses/parents may be irritable or intolerant, leading to friction and misunderstanding between themselves and their children.
- Children and teenagers can begin to seek attention or act disobediently, which usually means they are anxious or fearful.
- Family members' feelings for each other may change as they become more detached or preoccupied with their own problems and reactions.
- Family members may try too hard to help others and ignore their own needs.
- Family members' work or school performance and concentration levels may suffer.
- Spouses' sexual relationship may change.

- Family members may lose interest in leisure, recreation, sport or social activities.
- Teenagers may look outside the family for emotional support.
- Immediate post disaster responses may continue or appear for the first time.

Long term effects

Sometimes problems become evident for the first time, months or years after the event, and often appear as everyday issues.

- Memories of the disaster may come back if family members are involved in another crisis.
- Family members often need to go over the events—perhaps for months or years—to better understand what has happened.
- People may find future disasters harder to handle, particularly when similar feelings occur.
- Family members may hide painful feelings until things have returned to normal, and only then show their distress.
- Immediate or medium term effects may occur as delayed reactions or may become habits.

You should consider any major change or problem in a family or for individuals could be related to the disaster, even if it happens a few years later.

These problems are all normal reactions to an event that has affected the whole family. A few ways to help your family recover after a disaster include:

- **Keep communicating**—talk about what is happening, how you each feel and you need from each other to avoid feeling alone, isolated and misunderstood.
- **Share information**—children, teenagers and toddlers know something is going on and the reality is easier to deal with than the unknown.
- **Do things together**—make time for fun.
- **Keep family roles clear** —don't let children to take on too much responsibility for too long. Understand if a family member can't fulfil their role and talk about how they will resume it when they are ready.

- **Be active**—tackle problems, seek help, seek information and don't let issues develop.
- **Look back**—consider how everyone has changed since the disaster. Look for the ways it has influenced everyone for better or worse.
- **Express emotions**—support distressed family members and give them time to understand their feelings.
- **Seek external support**—keep in contact with support groups, other family, friends, neighbours and workmates. Make sure your family doesn't become isolated.

9.1.7 Impact on Community

Communities that experience a natural disaster must also absorb the impacts of these destructive events. Many local communities lose so much in economic resources that recovery becomes difficult, if not almost impossible. Some communities find opportunity in the aftermath of a disaster to rebuild better and stronger communities than before. Communities must often recognize population, demographic, and cultural shifts as a result of the impact of the natural disaster on their individual citizens.

In case of any disaster or emergency, before any government machinery & support reaches or outside help gets galvanized, it is the Community which has to respond immediately (at the hour). As the Community plays the role of First Responder, it is critical that there is adequate awareness and preparedness at the Community level especially amongst the most vulnerable set of communities residing in the most vulnerable areas. Therefore, it would be pertinent to invest in efforts with respect to strengthening Community Risk Resilience at all levels to be able to adequately address Disaster Risk Reduction.

Community connections are the relationships necessary to develop, implement, and maintain an effective end-to-end early warning system. A multi-hazard warning center can only be successful if the warnings it produces reach individuals at risk and are easy to understand, resulting in appropriate responses. To assure warnings are most effective, the staff at a center must establish trusted partnerships among international organizations, governmental agencies, community leaders and organizations, businesses, and local citizens prior to issuing a warning.

Disasters and Communities

Disaster risk is on the rise throughout the world. Over the past two to three decades, the economic losses and the number of people who have been affected by natural disasters have increased more rapidly than both economic and population growth. The physical, social and economic losses caused by these disasters are particularly harsh for developing countries since they have a long-range effect in the development process. The impacts of the disasters are deeply related with the socio economic

conditions, tradition, culture, and climate of the communities. To minimize the damages caused by disasters, various efforts have been taken by government, international communities including donor agencies

Community Preparedness

Disaster preparedness provides a platform to design effective, realistic and coordinated planning, reduces duplication of efforts and increase the overall effectiveness of National Societies, household and community members disaster preparedness and response efforts. Disaster preparedness activities embedded with risk reduction measures can prevent disaster situations and also result in saving maximum lives and livelihoods during any disaster situation, enabling the affected population to get back to normalcy within a short time period.

Community preparedness can be thought of as the advance capacity of a community to respond to the consequences of an adverse event by having plans in place so that people know what to do and where to go if a warning is issued or a hazard is observed. This result can be achieved through the development of programs, in which communities establish plans, enhance communications, and heighten awareness among their citizens. Key components of a community preparedness program include.

- Raising public awareness and effecting behavioral change in the areas of mitigation and preparedness
- Deployment of stable, reliable, and effective warning systems
- Development of effective messaging for inducing favorable community response to mitigation, preparedness, and warning communications.

Community Empowerment

While disasters can strike wide region or a nation, that impact is felt at the community level although it may hit one or several communities at once. It is these communities that constitute what is referred to as "disaster fronts". Being at the forefronts, communities need to have capacity to respond to threats themselves. It is for this reason that communities should be involved in managing the risks that may threaten their well-being.

Community Based Disaster Management (CBDM)

Community-based Disaster Risk Management (CBDRM) is an approach that seeks to actively engage at risk communities in the identification, analysis, implementation, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities. Recognizing the role of communities and providing them with central and local government support is critical to maintaining and strengthening important community-based functions.

Most of disaster response can be characterized as command and control structure one that is top down and with logistic centre approach. Because of this, we observe, lack of community participation that results into failures in meeting the appropriate and vital humanitarian needs, unnecessary increase in requirement for external resources, and general dissatisfaction over performance despite the use of exceptional management measures.

Recognizing these limitations, the Community Based Disaster Management (CBDM) approach promotes a bottom-up approach working in harmony with the top - down approach, to address the challenges and difficulties. To be effective, local communities must be supported into analyzing their hazardous conditions, their vulnerabilities and capacities as they see themselves.

The CBDM approach provides opportunities for the local community to evaluate their own situation based on their own experiences initially. Under this approach, the local community not only becomes part of creating plans and decisions, but also becomes a major player in its implementation. Although the community is given greater roles in the decision-making and implementation processes, CBDM does not ignore the importance of scientific and objective risk assessment and planning. The CBDM approach acknowledges that as many stakeholders as needed should be involved in the process, with the end goal of achieving capacities and transferring of resources at to the community, which level who would assume the biggest responsibility in over disaster reduction.

Integrating Gender Issues in Community-based Disaster Risk Management

The aim of disaster risk management is to reduce vulnerabilities and build the resilience of communities to external shocks of major hazard events. The CBDRM approach advocates equal community participation and involvement. It focuses on community vulnerabilities and is couched within the broader sustainable development and poverty reduction goals. Using a gender sensitive approach ensures that DRM is conducted in a comprehensive way, addressing the needs and harnessing the capacity of all people (women, girls, boys and men) living in the community. A gender sensitive CBDRM approach can have a positive impact on many aspects of women and men's lives. Working with existing women's networks helps strengthening women's participation in the community's decision-making processes. For example, women's participation can highlight issues related to gender-based violence and strengthen women's roles in community-based early warning systems. It can also be used to elevate the role of women as leaders who can drive a risk reduction agenda in support of community development goals.
(East Asia Summit Earthquake Risk Reduction Centre)

9.2 COMPENSATION AND LEGAL ISSUES AMONG THE DISASTERS SURVIVORS

Disasters are going to occur, even if we don’t know which ones they will be, when or where they will happen, or how devastating they will be. Beyond roles it might play in disaster prevention (or harm reduction), what

is the responsibility of government with respect to victim compensation – compensation for personal injury and death, property losses, and financial losses? After setting out some preliminary considerations as to the nature of disasters and the place of both private insurance and tort law in providing disaster compensation, I suggest there are at least five potential roles for government:

- Facilitating the Receipt of Private Compensation for the Consequences of a Disaster
- Assuring Insurance Availability for Disaster Victims When the Market Fails to Do So
- Providing Victim Compensation Either When Government Should Have Prevented the Disaster or When It Is the Sort of Disaster We Aspire to Have Government Prevent
- Providing Victim Compensation as an Alternative to Tort Recovery
- Providing Victim Assistance to Overwhelmed Communities For Reasons of Altruism and National Solidarity Finally, I briefly explain that the decision to aid disaster victims is only the first step, and that an equally difficult next step is deciding in what form that aid should take.

Roles of Government in Compensating Societal Disaster Victims

Assuming that, despite prevention efforts, major disasters are going to occur anyway, what are roles of government with respect to victim compensation in the aftermath? Note well, that effectively helping victims after a disaster often requires government action beforehand, by putting victim compensation arrangements in place. Note too that, merely because a true societal disaster has occurred, that does not necessarily mean that some special disaster-based scheme must come into play.

A. Facilitating the Receipt of Private Compensation for the Consequences of a Disaster

One basic role of government is to facilitate the availability of private sources of compensation in the event of a disaster. This partly involves the protection of victims' ordinary legal rights. I have two related, but different, jobs in mind here.

Enforcing insurance contracts and ensuring that insurers are solvent and pay what they owe First, by opening up its courts, government can help assure that those who bought insurance before a disaster occurred and later find that their valid claim is rebuffed, are able to sue their insurer and win a judgment against the defendant. In cases of egregious refusals to pay valid claims, government can (and many states do) allow victims to assert and, on proper proof, win substantial additional financial compensation (for pain and suffering, as punitive damages, and so on) as a way to prod insurers to live up to their contractual obligations in the first place.

Beyond that, government may also take steps (as state governments generally do) to assure that insurers will actually have the money to pay valid claims in the event of a disaster.16 This requires regulators to be certain that insurers are both charging actuarially adequate rates (and not cutting premiums too much in order to obtain more business) and managing the premiums collected in a responsible and secure manner. In addition, to deal with the problem of insurer insolvency, states typically have created guaranty funds though which, in effect, solvent insurers step up and provide at least limited benefits for claimants whose insurers have financially collapsed.

These jobs of helping policy holders collect from their insurers apply, of course, to claims arising out of events that are, and are not, societal disasters. And while assuring insurer solvency may be especially important when it comes to events that occasion multiple, large claims, this is a good example of how more general public action, aimed at a broader problem, comes into play to help societal disaster victims.

It is also worth noting in this context that, although governments often interfere with respect to various terms that are to be included or excluded from insurance contracts in general, they have typically permitted casualty insurers to exclude property damage coverage that is the result of various specified disasters as noted above. Understandably, government must be careful not to require private insurance coverage of the sort that will cause insurers to withdraw from the business entirely.

Creating enforceable tort rights against those who cause manmade disasters

I have already briefly discussed the fact that some disaster victims will have valuable tort claims against those who caused their losses, and I simply want to note here that it is another basic role of government both to define the relevant tort rights and then to make the judicial process available to those who make claims that cannot be resolved outside of court. As mentioned above, however, it is important to appreciate that, in defining the boundaries of tort rights, common law courts have not infrequently curtailed the rights of disaster victims out of a fear that otherwise the financial devastation of the defendant might lead to an even greater harm to the community.

Facilitating charitable/voluntary organizations and efforts to step in and assist victims of disasters

Finally, I want to emphasize under this heading that, in the aftermath of a disaster, government is hardly the only actor that might step in to help victims. Private actors with no formal legal duty to help might well also "come to the rescue." These can be individuals or local groups of people who spontaneously rise to the occasion, and they can be organizations set up in advance to respond. Indeed, quasi-public groups like the Red Cross

(which typically works along side FEMA) have disaster response as their central mission

Government can take steps in advance and after a disaster occurs to promote this outpouring of private "charity" (both its quality and quantity). This can be done by encouraging donations to and voluntary service commitments to disaster relief organizations (e.g., by providing tax benefits for donors). It can be done through advance coordination agreements meant to help assure that there is as little duplication of effort as possible once a disaster occurs, that groups are able to take advantage of their expertise, and so on. Government might also simply try to promote a general cultural norm that it is a moral obligation to help one's neighbors, community members, or even fellow countrymen in the event of a disaster (for example, by honoring those who have done do, by promoting this value in schools, and so on).

There is inevitably some tension between the role of private actors and that of government in the provision of disaster relief. Basically, government has to be concerned about discouraging private relief (or indeed, personal advance provision for financial compensation) by promising to take care of everything if a disaster hits (or even simply by being seen to do so once disasters strike, regardless of whether anything specific was promised in advance). Doing so risks causing potential victims and their would-be helpers to ignore the problem and just step aside and leave it to government when a catastrophe happens. Hence, in order to stimulate those private actors, government somehow has to define its role as supplementing and not supplanting that of others. I will discuss this coordination problem further below.

B. Assuring Insurance Availability for Disaster Victims When the Market Fails to Do So

Stepping in when the private insurance market fails to cover property losses from certain disasters

As noted already, sometimes the private insurance market by itself will not provide insurance coverage for the consequences of certain disasters. In that case, government might act, either by becoming an insurer itself and offering (or even mandating purchase of) the missing coverage or by working with insurers to get (or force) them to provide the coverage.

The latter could involve getting each insurer of similar risks (e.g. property insurers) to take on its "fair share" of the target risk (like earthquakes). Or it could involve creating of a fund paid for by insurers (presumably from extra premiums collected from its customers) that covers the target risk (like earthquakes). Alternatively, government may become the actual insurer of the risk (like earthquakes) although even there government might yet enlist private insurers in the roles of selling the product,

collecting the premiums, and perhaps even processing the claims were the covered risk to occur.

The regime supervised by California's current California Earthquake Authority is one example of how government can get involved with creating a market for insurance coverage for a risk that is not covered by nearly all basic property insurance policies sold in California. A somewhat different role is played by the state of Florida under the Florida Hurricane Catastrophe Fund that was created in 1993 in the wake of Hurricane Andrew. The National Flood Insurance Program is an example of how the federal government stepped in to create coverage for a risk that private insurers were generally unwilling to underwrite on their own. Recent governmental interventions designed to assure the availability insurance against the consequences of terrorism (most importantly, a temporary agreement by the federal government to pay for a share of covered losses) is yet another. These schemes are all aimed at physical property damage. Although not now in place, it is imaginable that, with the help of government, the insurance industry could provide property insurance against the full range of natural disasters.

9.2.2 Assessment of Damages

An important issue confronting any such arrangement – either a comprehensive scheme or one aimed at a specific disaster risk -- is the premium structure. Is the government arranged scheme, on average, charging the equivalent of "market" rates, or are taxpayers subsidizing those who buy the insurance? A justification for subsidy might be the otherwise low income status of the victims. A second-best sort of justification might be that, if, after the disaster, political realities would require government to come in with taxpayer money and help out anyway, it might be socially desirable to get at least some contribution in advance from those who are specifically at risk.

Additional critical pricing issues are (1) whether individual or classes of buyers will be charged differently because they run different risks, and (2) to what extent will underwriting investigations be carried out and underwriting conditions be attached so as to promote efficient precautions by those who are at risk. Failure to differentiate among insurers in the way a private market would results in subsidies. To be sure, sometimes these seeming subsidies are justified because price classification is simply too costly to engage in. Other times, failure to discriminate in pricing may reflect a positive choice to favor certain parties who are risk, such as low (or high) income people. In any event, the absence of actuarially sensible risk-related premiums can discourage both insurance companies and certain property owners from participating, and it can cause some people to incur risks they would not run were their insurance costs actuarially fair.

Beyond assuring the availability of certain types of property damage insurance, other federal insurance programs protect against potentially

disastrous financial losses. Moreover, unlike, say, the California earthquake program or the National Flood Insurance Program, these financial loss insurance regimes are largely universal (effectively mandatory). They include the programs that insure bank deposits,24 private pensions,25 and securities held by stock brokers26 against the financial collapse of various institutions.

Governments also create social insurance programs that come into play in the event of a disaster, even if these mechanisms are by no means restricted to disaster settings. In this respect they are like efforts to assure insurer solvency, as noted already.

Social insurance is aimed at personal loss, not property loss. For example, in the United States our social security system effectively requires workers to partially insure against loss of income from retirement or death, the Medicare Part A component of social security in effect requires workers to insure against the need for costly hospitalization services when they become elderly (or disabled), and the unemployment compensation system in effect requires workers to partially insure against the loss of wages arising from involuntary unemployment. Their mandatory nature makes them like bank deposit insurance, but unlike flood insurance.

Mandatory social insurance is perhaps best justified on the combined grounds that some workers would otherwise feel themselves unable to afford this sort of insurance and that many would, in any case, simply choose not to purchase coverage that later turns out to be needed. This can be viewed as a kind of collective paternalism that forces people to do what is best for their longer run interests, regardless of their short term preferences. Alternatively, it can be viewed as an effort to force people to contribute in advance their own fair share (or at least something) to a scheme that will help them in times of personal need, rather than having them rely upon taxpayers in general when the time comes.

The key point here is that, when people suffer personally from a societal disaster, general social insurance is already in place, and so certain disaster victims (and their families) can call on this scheme to help compensate for their income loses, medical expenses, and so on. If nothing else, this means that any special disaster victim compensation arrangement needs to consider how to deal with the availability of basic social insurance. And it may well mean that the wider and more generous the underlying social security safety net, the less need there will be for special governmental intervention in case of a disaster.

Furthermore, while not exactly social insurance, it is also vital to appreciate that all sorts of other government "relief" programs that are available to victims of what might be seen as personal disasters are normally intended to be there to help as well when it is a societal disaster that has occurred. This includes income support provided by welfare programs like TANF, housing support programs like public housing units

and so-called section 8 housing vouchers, food assistance provided by food stamps and so on. Again, special disaster relief schemes need to take that fact into account.

As an aside, some people will already be receiving benefits from needs based relief programs and/or social insurance schemes like unemployment compensation when a societal disaster strikes their community. Hence, an a important, and sometimes quite difficult, role for government is simply to assure the continued provision of assistance to those who were already obtaining that support before the event (a problem much exacerbated in the aftermath of hurricane Katrina, for example, because so many claimants were relocated to other states)

9.2.3 Providing Compensation

C. **Providing Victim Compensation Either When Government Should Have Prevented the Disaster or When It Is the Sort of Disaster We Aspire to Have Government Prevent**

First, suppose government actors should have prevented a catastrophe from occurring, but failed properly to carry out precautionary obligations, or carried them out in an inadequate or careless manner that facilitates the disaster. In such settings, the public may believe that, as a result, government has an obligation to compensate the victims. People can have rather different visions of what they mean by "government" in such settings. One approach is to think of government as some independent body with money, like a corporation or other private enterprise, whose treasury is appropriately tapped when the misfeasance or nonfeasance of its employees or officers brings about a disaster that should have been avoided. Perhaps the more realistic view is that if we collectively (through our elected leaders and our employees) failed to get the job properly done, then perhaps we collectively have an obligation to provide compensation to those who are harmed as a result. However this is conceived, one way to effectuate this role of government is to allow victims to file tort claims against the government. Yet, in fact, the Federal Tort Claims Act (FTCA) is quite unreceptive to many of the claims that would likely be made with respect to failures by federal officials to prevent disasters. The result is that when the finger of responsibility is pointed at federal government actors, even carelessness, incompetence or both may not suffice to impose financial responsibility via tort law on the deepest of pockets we have – even in cases where, had the wrongdoing actors been private parties, tort recovery would have been allowed (and the actors' employer would be vicariously liable).

This immunity is especially sweeping at the federal level because the FTCA protects government from tort liability for the consequences of discretionary acts (a concept that has been broadly defined).

This includes discretionary acts that juries would later have found to be altogether unreasonable. Other federal statutes contain special tort

immunity provisions, for example, in legislation governing the flood control and flood insurance program. State tort claims acts often contain weaker governmental tort immunity provisions, although the law in some states is largely parallel to federal law. This discretionary immunity provision of governmental tort claims acts primarily rests on considerations of separation of powers. The idea here is that the judicial system should not be second guessing the policy (and related) choices made by the executive/administrative branch. The point seems to be that, if the public objects that a wrong decision was made, it is not to register this judgment through juries, but rather through other political processes, such as by pressuring legislators or executive actors to decide differently, by voting those who are misbehaving out of office and so on. Of course, these alternative remedies are of little solace to disaster victims who are now suffering because of incompetent government.

On the other hand, it is important as well to emphasize that immunity under tort claims acts does not necessarily mean that government will, or should, turn its back on its victims. It is simply that their remedy, if any, is not to come through tort law. That, in turn, suggests that a role of government might be to create a specific disaster-compensation scheme (other than tort law) to provide compensation in such instances.

In any event, it is not only for specific instances of public "fault" for which government may be called upon to provide disaster compensation. As a society, we broadly see it as government's job, for example, to provide public security – to protect us against crime, of both the routine sort and the special sort that amount to social catastrophes, like large-scale terrorist attacks. This goal for government is a matter of aspiration, and thoughtful people concede that is simply not feasible for government to prevent all such crimes.

Nonetheless, when such events do occur that are either personal disasters for victims or broader societal disasters, then, as members of society at large, we may conclude that, in effect, we should all chip in and provide compensation to victims.

State "victims of violent crimes" laws29 are perhaps best viewed as an example of government acting in this way. These schemes (which are neither all that effective nor very generous) are usually meant to provide financial help to those who are made destitute or otherwise devastated by some violent crime to their person. Government aid provided to victims of urban riots might also be viewed in this way.

In hindsight, some might argue that the September 11th Compensation Plan should be seen as a program by which government is taking responsibility for its failures to prevent the terrorist acts of 2001.30 But, even if one believes that the federal government could not have stopped these terrorist acts (which was the general view at the time the compensation plan was enacted), the 9/11 plan might be justified by the

aspirational idea that, since it is government's job to stop terrorism in general, it is government's duty to compensate terrorism victims even if their harms were not reasonably preventable in this instance. So, too, the scale of the extra-ordinary assistance voted by Congress in the aftermath of hurricane Katrina may be justified either on the basis of specific prevention failings of federal officials (if one believes that) or on the basis of the more general social understanding that flood prevention is a federal responsibility.

D. Providing Victim Compensation as an Alternative to Tort Recovery

Sometimes the prospect that future or existing victims will sue in tort those responsible for a disaster (or potential disaster) is socially daunting. On the one hand, the fear of possible tort liability in the future, were a disastrous accident to occur, may prevent what otherwise is thought to be a socially desirable project from going forward at all. On the other hand, once a disaster has occurred, the potentially crushing burden of tort liability may threaten the very existence of some highly desirable social good or service.

In these settings, one possibility is for government, either ex ante or ex post, simply to bar tort claims (or at least some claims, or at least limit the amount of claims). This is, in effect, what the New York Court of Appeals did in the "blackout" case discussed earlier when, ex post, it cut off the electric company's tort responsibility to those who were not direct customers of Con Edison. This decision followed an earlier New York case (which generally reflects the law across the U.S.) which freed a water company from potentially devastating tort liability for carelessly failing to provide the water it had promised to make available at local hydrants for firefighters to use to contend with burning buildings.

Denying a tort remedy need not necessarily mean that victims simply go uncompensated, however. For fire risks, for example, one explanation for the tort immunity of water companies is that these accidental losses may well be better dealt with via private fire insurance (both because it is both widely available and widely purchased and because that insurance, unlike water rates, is priced to reflect the fire risk attached to the insured building).

- **Compensation plans adopted in advance of a (potential) disaster that are designed to facilitate the pursuit of a social good:**

When the nuclear power industry was getting underway, commercial liability insurers were unwilling to provide broad coverage against the risk of harm from a serious reactor meltdown, presumably on the basis that (1) the likelihood of this happening, although very small, was quite unpredictable, and (2) the amount of harm, while potentially astronomical, was also unpredictable. Faced with altogether inadequate insurance coverage, the nation's electrical utility companies announced that they

were unwilling to develop nuclear energy because they were unwilling to risk the company's entire wealth on the even slight chance of serious accident.

Some opponents of nuclear power argued that this was a good reason for never allowing this sort of development in the first place, i.e., an unwillingness of the industry to take responsibility for the social costs it might impose. Yet, politicians concluded that the benefits of nuclear power outweighed the disaster risk, and that society would be harmed were nuclear power to be stalled because of the overhang of tort liability.

Hence, in 1957 Congress adopted the Price-Anderson Act32 which simultaneously restricted the tort rights of potential victims of a serious nuclear accident and mandated private arrangements to assure at least some compensation to victims were such an accident to happen. This scheme technically did not create a substitution for tort law, but it amounts to much the same thing. Specifically, the Act provided that the power company where the accident occurred would be strictly liable in tort for the consequences (this was probably the law of most states anyway, although there had not then been any cases directly on point). But it limited tort recovery in an inventive way. First, power companies with nuclear reactors were required to purchase the level of liability insurance that the insurance industry was then willing to sell (and over time as the industry capacity has grown, Congress has amended the Act to insist on higher coverage). Second, since this coverage would be quite inadequate in the event of a grave nuclear accident, the Act further provided that, were there such an accident, then every company in the nation operating a nuclear plant would have to contribute into a fund a specific amount per plant that would be used to pay additional victim compensation in the local area where the disaster occurred. The total contribution that would be available to the fund has increased over time, both as the number of nuclear power plants grew and as the Congressionally-required contribution per plant has been expanded. Through this plan, the government, in effect, forces the entire industry to pool its resources and collectively insure against the risk all of the firms face.

Even this much expanded coverage, however, would presumably not suffice were the U.S. to suffer an accident of the Chernobyl sort. Fortunately, nothing like that has happened in America so far, and so we have no experience with what would happen next. The Act promises vaguely that Congress would then take appropriate action, but does not provide for exactly what that would be or whether it would be other than what the federal government already provides in the event of other disasters, discussed below.

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have no experience with what would happen next. The Act promises vaguely that Congress would then take appropriate action, but does not provide for exactly what that would be or whether it would be other than what the federal government already provides in the event of other disasters, discussed below.

To break the log-jam, the federal government relieved the vaccine makers of the tort liability they feared; instead, simply put, Congress agreed that the government itself could be sued as though it were the vaccine provider. Alas, things turned out very different from what was anticipated. The dreaded pandemic did not arrive. The vaccine was taken by a substantial number of people, but, as a bitter irony, it turned out to be highly dangerous in some cases, and many were seriously injured. In the end, the federal government wound up paying substantial victim compensation (through tort law)

- **Compensation schemes designed to relieve a tort law crisis with respect to a social good**

A somewhat different strategy was embraced with respect to childhood vaccines. In the 1980s, pharmaceutical firms making those vaccines were beginning to be successfully sued by parents on behalf of children who, the parents claimed, were being severely injured by the side effects of vaccines (especially the vaccine aimed at preventing pertussis, or whooping cough as it is informally called). Were the claims about side effects correct, the nation had a public health disaster on its hands. While it was very important for children's health to curtail whooping cough, at the same time it would be very bad if many children were being gravely harmed in the process. National public health leaders concluded that, on balance, continued widespread vaccination was the socially more desirable route for the nation to take, especially as there was some doubt in their minds that the vaccines were actually having the claimed side effects. But, faced with potentially enormous tort liability (especially as compared with the amount they could realistically charge for their products), the vaccine makers threatened to cease vaccine production.

Notice, that what is different about this category from that described above, as illustrated by nuclear power and swine flu, is that here injuries have already occurred and tort suits have been filed and some have already been successful. Yet, as with those other examples, the fear of future tort liability was seen to threaten the provision of something vital to the nation.

In response, Congress adopted the Childhood Vaccine Act.34 This law provides an alternative to the tort remedy. Claims can be filed with the U.S. Court of Claims on behalf of any child who displays certain symptoms within a certain period after receiving the vaccination. The Court then determines a compensation amount that the family is offered. A key element of the compensation package to be offered is that, in no case, will the amount of noneconomic loss compensation exceed $250,000

(which is far less than some juries had been awarding for pain and suffering and possibly for punitive damages in certain individual cases).

Families are not required to accept the sum offered by the Court of Claims, but if they reject that sum and decide to sue the vaccine maker anyway, the plaintiffs are then subject to federal rules as to tort liability that make it much harder for them to win, at least in states that had earlier moved in the direction of imposing strict liability on the defendants merely for making a product that a jury might find was the cause of the child's injury.

This plan is not funded by taxpayers generally. Rather, a fee attached to each vaccination, thereby, in a sense, making families as a group insure against the risk that their child might be an unlucky victim (this puts aside issues of whether individual families actually pay this fee or have it waived or paid for by their health insurance)

Later, a scientific consensus developed (although not everyone has accepted it even yet) that the pertussis vaccine was not actually the cause of the harms the claiming children's families were assigning to it – the position of the vaccine makers all along. The initially sharp fall off in the share of parents getting their children vaccinated has abated. And the number of claims that the whooping cough vaccine is causing severe harm has dropped. Nonetheless the statutory compensation scheme, with its presumption about causation, has continued in effect. And despite paying out benefits to about two thousand claimants, the scheme has faced considerable criticism for its delays and for what are seen as efforts by claims administrators to find creative ways of denying eligibility.

Florida and Virginia have also enacted plans with respect to medical malpractice that are somewhat similarly constructed, although they contain key differences.35 In those instances, the states were faced with what they feared would become something of a catastrophe in the provision of medical services, especially with respect to the delivery of babies. At the time, large numbers of doctors were said to be refusing to do this work and moving their practices out of state.

The seeming cause of this pending potential disaster in the provision of medical care was a few extremely high medical malpractice awards against a few doctors in so-called "bad baby" cases, where the harms suffered by a severely damaged newborn were being blamed on malpractice in the delivery process. The doctors asserted that these were unavoidable birth defects or unavoidable consequences of difficult childbirths, and that they were being held strictly liable. Regardless, even for doctors who had never been sued the consequence was that either malpractice liability insurance was no longer available (as some insurers withdrew from the market) or the rates charged obstetricians were skyrocketing, making it financially infeasible for many doctors to do this sort of work in those two states (or so they claimed).

In order to assure the continued provision of obstetrical care, the legislative solution adopted in both Virginia and Florida was intended to take away the right of future "bad baby" claimants to sue in tort, and in its place provide a compensation scheme for these children. As with the federal Childhood Vaccine Act, these state compensation plans, while mandated by legislation, are not funded by taxpayers at large, but instead by various actors who provide medical services (who presumably pass the cost on the public at large through higher fees).

These plans, especially Virginia's, have been criticized from a variety of perspectives and have not been copied elsewhere, although they continue in force. Moreover, creative lawyers have found ways to continue to bring tort claims in certain settings, especially under Florida's plan. Yet, whatever the plans' shortcomings or their contribution to solving the problem they were aimed at, the crisis in the provision of obstetrical services appears to have passed in both states.

- **Preventing a possible social crisis that tort litigation might create**

As noted at several points already, the terrorist acts of 9/11 lead very quickly to the September 11th Victim Compensation Plan.36 One justification for the adoption of the plan, as already explained, is that, even if government could not reasonably have prevented these acts (a now much-contested matter), we look to government generally to protect us from terrorism and when it does not, we pitch in as a nation to provide relief to those (or their families) who had the bad luck of being victims.

Yet, because of past practice, it is not altogether easy to explain the 9/11 plan on this basis. For example, even in recent years no such plan was enacted after the terrorist attacks on the ship the USS Cole (although arguably that event, especially since it took place outside the U.S. was not clearly understood to be a national "disaster"), or after the Oklahoma City bombing (although that was carried out by what arguably amounted to a domestic terrorist, perhaps social solidarity to help out victims of terrorists is more clearly felt with respect to foreign terrorists), or after the first World Trade Center bombing (although the harm done actually then was arguably not enough to amount to a disaster).

So, while it is true that the 9/11 terrorist acts were gigantically more harmful than those other examples of terrorism, there was a further feature of this event that I believe played a key role in the adoption of the compensation plan. From the outset it seems that our political leaders wanted to be sure that the national focus would remain centrally on the terrorists as the wrongdoers. In part, this may have been a desire by the Bush Administration to keep attention away from possible security lapses of the federal government, although, as a litigation matter, any such carelessness of that sort was probably immunized from tort liability anyway.

More important for my purposes here was the matter of potential airline tort liability – say, for the failure to secure access to the cockpit, or for failure to better supervise the screening of passengers. Not only might lawsuits against the airlines potentially undermine the foreign affairs line that the terrorists were the only bad guys here, but also, given the enormity of the disaster, tort liability could financially destroy two of our largest domestic carriers (United and American) both of whom were already in deep financial difficulties at the time. After all, earlier on Pan Am had been successfully sued for very large sums in connection with a terrorist destruction of one of its jets over Lockerbie Scotland in 1988.

(Roles of Government in Compensating Disaster victims)

9.2.4 Corruption in Compensation

Empirical analysis of the impact of disasters on corruption is considered instructive for designing appropriate incentive schemes to deal with disasters. Corruption is observed to be negatively associated with economic growth (Mauro 1995; Tanzi & Davoodi 1997; Johnson et al. 2011). However, such an observation is not congruent with the finding that natural disasters cause the public sector to become more corrupt in OECD countries than in non-OECD countries. The fact that the effect of frequent disasters such as floods on corruption is greater in OECD countries than in non-OECD countries can be interpreted as follows. Floods tend to occur in the agricultural land because agricultural land requires irrigation. It is difficult for farmers to move to areas where floods are unlikely to occur because such areas are not suited to agriculture. The population working in the agricultural sector is larger in developing countries than in developed nations. Accordingly, the opportunity for the movement of population away from risky areas is low in developing countries. Hence, this is the reason why people in these countries reside in areas at risk of floods; it tends to reflect the nature of their work, rather than their strategic behavior to pursue disaster compensation.

People can benefit from windfalls that may be derived from the disastrous event. If the benefit is larger than the damage, residents in disaster-prone-areas have an incentive to continue to live there. Thus, under such conditions in developed countries, there is the possibility of an inflow of population into disaster-prone areas because "the prospect of receiving federal and state reconstruction assistance after the next hurricane strikes supplies incentives for others to relocate their homes and businesses from inland areas of comparative safely to vulnerable coastal areas" (Shughart II 2006, p.44)13. Considering what has been discussed thus far leads to the claim that in developed countries, people have an incentive to live in disaster-prone areas because the expected benefits of the occurrence of a disaster are larger than the damages. As a consequence, disaster-prone area increases corruption.

Rational individuals may possibly exploit devastating incidents such as natural disasters. Political rent-seeking activities possibly sacrifice direct benefits to disaster-hit areas in favor of self-interest. Leeson and Sobel (2008) found that disaster-relief windfalls increased corruption. The characteristics of disasters differ, and thus, they are predicted to have different influences on corruption. However, little is known about whether the different disaster types result in different outcomes. Furthermore, the effects of disaster seem to be different between developed and developing countries. To examine this statistically, this work used panel data from 84 countries for a 21-year period from 1990 to 2010. The major findings of this study are the following. (1) Natural disasters lead the public sector to become corrupt. (2) Disaster with the large predicated damage increase corruption not only for developing countries but also for developed countries. This indicates people living in disaster-prone area anticipate disaster compensation. Analogous to the logic of literature on foreign aid inflow, it is the disaster relief money inflow that cases the corruption, and more money causes more corruption (Leeson & Sobel 2008). (3) The effect of disasters is greater in developed countries than in developing countries. (4) In the developed countries, frequency of occurrence of disaster plays more important role on increasing corruption. On the other hand, in the developing countries, damage per disaster plays more critical role on it.

From what has been examined in this paper, I derive the argument that the moral hazard problem occurs because victims require the compensation for disaster, which is larger than its damage. However, degree of corruption caused by disaster depends not only on the amount of damage of disasters, but also on its frequency and damage per disaster. People of the developed countries are likely to reside in disaster-prone area to seek for compensation of disaster. The disaster warning systems is generally thought to be effective to reduce the damage of disasters in the developed countries (Escaleras et al., 2008). The more information about disaster is provided, the more people are able to evacuate from it. This possibly gives incentive of people to reside the disaster-prone area to seek for compensation. Such unanticipated behavior possibly caused the government failure (Shiue, 2004)

Natural disasters affect millions of lives each year and bring humanity together around a common goal of helping the victims and supporting reconstruction. The Asian tsunami of 2004, the 2010 earthquake in Haiti, or the deadly foods in Pakistan later that year are just a few examples of tragic events that triggered the outpouring of donations to relief efforts. Yet, all too often this well-intended generosity fails to translate into commensurate results on the ground.

One reason is the sheer volume of aid that tends to overwhelm the absorptive capacity of governments, aid agencies, and non-governmental organizations (NGOs). Another key reason is corruption caused by the

urgency to disburse aid that often leads to dangerous corner cutting when it comes to controls on spending and accountability.

The need to tackle corruption in disaster aid has been brought into focus again by the destruction wrecked by typhoon Haiyan, or Yolanda as it is known in the Philippines. In response, so far nearly 18 billion pesos ($414 million) in cash and relief goods have been pledged. The challenge of administering this magnitude of aid creates considerable corruption risks.

As Transparency International put it in its handbook of good practices on preventing corruption in humanitarian operations, published after the 2004 Asian tsunami, “That this occurs is hardly surprising: relief is delivered in challenging environments. The injection of large amounts of resources into poor economies, where institutions may have been damaged or destroyed, can exaggerate power imbalances and increase opportunities for corruption.”

President Benigno Aquino had made fighting corruption his priority long before the typhoon hit. To manage disaster aid, the government launched an online platform, Foreign Aid Transparency Hub (FAiTH), to track donations and provide status updates on relief and rehabilitation efforts. However, even the administration members recognize that there is still plenty of room for scammers and corrupt official to game the system. A recent statement from the Department of National Defense cautioned, “We would like to warn the public to be vigilant and not fall to this modus operandi by unscrupulous individuals.”

It doesn’t help that coordination between the national government and local government units (LGUs) in the Philippines is notoriously difficult. The local government code, passed in 1991, devolved significant powers to LGUs. In principle the devolution was supposed to make local authorities more responsive to needs on the ground but in practice it is often abused by officials who carve out corruption-prone spheres of nearly total control.

What is more, trust in public officials at all levels has been severely undermined by the ongoing pork barrel corruption scandal known as PDAF scam. The scandal implicates three sitting senators, five former congressmen and five ex-government agency chiefs in stealing public funds meant for local development projects by creating bogus non-governmental organizations through which significant amounts of money were defrauded.

“There’s an urgent call now for us to monitor the movement of foreign aid funds for Yolanda so they will go exactly where they’re supposed to: to the survivors of the typhoon,” said Undersecretary of Budget and Management and Chief Information Officer Richard Moya.

Fortunately, there are lessons learned that the Philippines can apply. In response to the 2004 tsunami, the Asian Development Bank (ADB)/Organisation for International Co-operation Development (OECD)

Anti Corruption Initiative for Asia and the Pacific, along with Transparency International, convened an expert meeting in Jakarta that brought together government and civil society representatives from India, Indonesia, Malaysia, Maldives, Sri Lanka, and Thailand, as well as donors and NGOs. The experts identified six essential elements needed to curb corruption and reduce waste in disaster relief and reconstruction aid: country ownership; community-driven and participatory processes; transparency of aid flows; financial safeguards and administrative capacity; oversight, monitoring, and evaluation; and effective anti-corruption enforcement and complaint handling.

In addition to applying these principles, donors and recipient country governments should also consider ways to facilitate structured giving rather than one-off donations, when necessary decline donations, and take steps to improve the overall level of governance. A successful example of the latter in the Philippines has been the work of the Institute for Solidarity in Asia (ISA) based on its innovative Performance Governance System (PGS) meant to translate development goals into concrete strategies and to combat corruption in government. Since its inception in 2004, the PGS has helped national departments and local governments alike.

In the City of Iloilo, for instance, each department in all sectors developed a scorecard to measure targets and monitor progress toward specific, measurable goals. The city also formed the technical working group dedicated to the PGS that assisted these departments in implementing their scorecards. As a result, local income increased from 825 million pesos to over one billion pesos three years after the city's 2005 entry into the PGS program. In a striking example of improved coordination, Iloilo – despite being in Yolanda's path – experienced no typhoon-related casualties thanks to the efforts of the local disaster risk reduction management council, the Iloilo City Immediate Response team, and well-managed volunteers.

Corruption in disaster response can be a taboo subject because it exposes the ugly underbelly of ostensibly noble efforts. Yet, there are constructive steps that the Philippines and all other countries can take to mitigate corruption risks through putting appropriate policies and procedures in place, and through improving national and local governance.

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What are the physical impacts of disasters?

ii. What is the role of CBDRM?

iii. What is Corruption?

9.3 LET US SUM UP

Compensation and legal issues among the disasters survivors is the major issue discussed in this chapter. The impact at various ascpects such as physical, social, economical has been discussed in this chapter. Theses impact in turn reflects back to the individual, family and the community and also our psychological impact is seen much more after disaster taken place. To rectify it to some extend the compensation is been introduced for the survival purpose of the people based on the assessment of the damage that they have undergone during disaster.

9.4 UNIT END EXERCISE

1. Discuss on disaster impact on physical, social and economic conditions.
2. Write a note on the CBDRM.
3. Explain the Roles of Government in Compensating Societal Disaster Victims
4. How do the assessments of damage are done after disaster?

9.5 ANSWER TO CHECK YOUR PROGRESS

i. The physical impacts of disasters include casualties (deaths and injuries) and property damage, and both vary substantially across hazard agents.
ii. Community-based Disaster Risk Management (CBDRM) is an approach that seeks to actively engage at risk communities in the identification, analysis, implementation, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities.
iii. Corruption is observed to be negatively associated with economic growth.

9.6 SUGGESTED READINGS

"A Climate Risk Management: Approach to Disaster Reduction and Adaptation to Climate Change" UNDP Expert Group Meeting, Integrating Disaster Reduction with Adaptation to Climate Change, Havana, June 11-21 2002.

Allen, K, 2003, "Vulnerability Reduction and the Community Based Approach" (Ed.), Natural Disasters and Development in a Globalising World, Pelling.

Anderson, D.R, 2000, "Catastrophe Insurance and Compensation: Remembering Basic Principles", CPCU Journal, 53(2) 76-89.

UNIT X - HOUSING SUPPORT

Structure

10.1 HOUSING AND MATERIALISTIC SUPPORT FOR THE DISASTER SURVIVORS

Disaster housing assistance has evolved and must continue to change to better meet the diverse and complex needs of our Nation. Effective disaster housing is a critical step on the road to long-term recovery. We must find a better balance between providing housing assistance rapidly in the wake of a disaster and meeting the diverse needs of individuals and households, their communities, and the Nation. This will not be easy. Even without the complications of a disaster, portions of the country face growing challenges in housing people with disabilities, low incomes, and other special needs, including the elderly, persons living with chronic health challenges such as HIV/AIDS, and the homeless. These individuals are often affected more profoundly, and housing options become even more limited following a disaster.

- Support individuals, households, and communities in returning to self-sufficiency as quickly as possible. All those who provide disaster housing assistance must work collaboratively to help individuals, households, and communities meet their own housing needs and become self-sufficient as soon as possible. Permanent housing helps individuals resume their lives and is vital to restoring communities and the region following a disaster.

- Affirm and fulfill fundamental disaster housing responsibilities and roles. All organizations involved in disaster housing must understand and fulfill their disaster housing responsibilities and roles, build core competencies, and provide a foundation for effective housing assistance. We must align disaster housing roles with the fundamental disaster response and recovery responsibilities described in the National Response Framework and the National Strategy for Homeland Security. This includes

enhancing coordination and developing partnerships across all levels of government, nongovernmental organizations, and the private sector.

- Increase our collective understanding and ability to meet the needs of disaster victims and affected communities. Organizations at all levels must develop a deeper understanding of and be responsive to the complex needs of disaster victims. A host of individual needs affect housing choices and shape the demands for housing assistance, including who will need assistance and what type of assistance they will require. For example, individuals with special needs, including those with medical needs and persons with disabilities, may require additional support to accommodate assistive technologies, durable medical equipment, and/or service animals. Households with children and pet owners may also have additional needs. Housing assistance programs must include a range of options that can meet those needs and accommodate the diversity of cultures, languages, and dialects within a community, including the need for American Sign Language. Housing assistance programs will only be as effective as our ability to communicate with disaster victims, which will require improved public messaging to enhance preparedness efforts well before an event, as well as clear and effective housing information during response and recovery efforts.
- Build capabilities to provide a broad range of flexible housing options, including sheltering, interim housing, and permanent housing. All organizations involved in disaster housing must build their own capabilities, be aware of what support is available should they require assistance, and know how to request assistance. This will include establishing baseline capabilities for housing assistance and providing resources, such as toolkits, planning templates, and grant funding. Disaster housing capabilities must support the mission, be planned in advance, provide quality services in the time required, and be cost effective.
- Better integrate disaster housing assistance with related community support services and long-term recovery efforts. Disaster housing assistance options must go beyond the basics of providing disaster housing by connecting individuals and household to related community support services. Effective disaster housing assistance must also focus on improving case management services and increasing the level of awareness of support services for special needs populations, such as persons with disabilities, the elderly, the homeless, or persons living with HIV/AIDS. Other efforts may also be needed to help restore service delivery efforts by supportive care organizations that assist these populations. Those with household pets also may require support services.

- Improve disaster housing planning to better recover from disasters, including catastrophic events. All organizations involved in disaster housing must conduct joint planning to address housing needs, engage appropriate stakeholders, identify a range of options, describe how those options would be implemented, and identify the necessary resources. These plans must address the full range of potential disasters that could occur, including chemical, biological, radiological, nuclear, or explosive incidents in which the community is unable to return to the affected area. Planning should address small-scale as well as catastrophic events, which can encompass any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions. These extraordinary circumstances will place exponential demand on disaster housing. All disaster housing plans should include actions to prevent, protect, respond to, and recover from disasters. For example, protection activities may include establishing higher structural performance levels for housing, such as stricter building codes, or retrofitting structures in earthquake- and hurricane-prone areas.

Individuals and Households

Individuals have an essential role in disaster response and recovery that starts with understanding personal responsibilities and planning ahead. To increase preparedness, individuals should develop personal emergency plans for their households and pets, including planning for their own needs for the first few days following a disaster, such as medicine, essential documents, and drinking water and food. As part of their personal emergency plans, individuals with special needs, including those with disabilities, should also assess what additional services they may need during and after a disaster, know what will be available in their community, and learn how to obtain support. Part of preparing for a disaster includes thinking through how to manage damage to or loss of one's home. This includes identifying household needs for sheltering or interim housing and ensuring that all owned or rented property is adequately insured. In addition, individuals who live in flood-prone areas may be able to obtain flood insurance policies through the National Flood Insurance Program. During a disaster, individuals should monitor local media to obtain emergency information and implement their emergency plans. Individuals can also volunteer with national disaster service organizations or local organizations in their own neighborhoods. For additional information on emergency plans, visit the Department of Homeland Security's Ready

Disaster Housing: A Planner's Dilemma

It is critical to anticipate the challenge of providing housing assistance that meets diverse individual, household, and community needs. Meeting urgent housing needs while enabling individuals, households, and communities to rebuild and restore their way of life is a complex equation that requires all those involved in disaster housing – including all levels of government, nongovernmental organizations, and the private sector – to navigate a broad range of competing and interdependent factors. This burden falls primarily on planners at each level, who must address these factors to develop deliberative disaster housing plans and conduct crisis action planning during a disaster that adjusts to meet the real-world circumstances. This process provides critical guidance to decision-makers when they need it most.

As part of this dilemma, planners must:

1) assess the nature and magnitude of a disaster,
2) prioritize individual and household needs,
3) understand the broader community characteristics,
4) be familiar with available housing options that are appropriate within their area.

Planners must not only have a comprehensive understanding of each of these four factors, but must also consider the operational issues such as providing accommodations for disaster workers and those involved in infrastructure restoration. Planners must also be able to inform and provide guidance to decision-makers on how to balance competing issues – simultaneously responding to urgent needs, continually adjusting as those needs evolve, and developing permanent housing.

While these factors can be addressed independently, the planner's dilemma is to consider the interdependencies among these factors. For example, the perfect shelter with adequate capacity will not work if it is available too late or is too far away. This dilemma becomes increasingly difficult to solve as life-threatening or urgent needs emerge and resources become scarce or delayed.

Nature and Magnitude of a Disaster

The nature and magnitude of a disaster drive the size, scope, and scale of housing assistance and determine duration of assistance that may be required, with catastrophic events likely to require substantial permanent housing assistance for extended periods of time. Planners must develop a range of housing assistance that addresses the full spectrum of disasters that could occur, from smaller scale events of shorter duration and concentrated impact, such as tornadoes or wildfires, to large-scale catastrophic events that are of a considerable magnitude and result in widespread devastation across a substantial area or region. Housing

assistance must also address the full range of potential disasters, from natural disasters to terrorism incidents and manmade events.

While the needs for smaller scale disasters can be met through a range of sheltering and interim housing options, large-scale catastrophic events will require extensive long-term reconstruction and rehabilitation to support community and regional renewal and revitalization. Some catastrophic events, such as release of a radiological or biological agent or a nuclear detonation, may render an area uninhabitable for extended periods of time and will require intensive advance planning. The exponential demands of a catastrophic event are arduous and cannot be addressed by merely doing more − substantial planning at a higher level is required to prepare for the magnitude of a catastrophic event and develop housing options that can meet the potentially overwhelming demand for immediate shelter, interim housing, and permanent housing. In extreme scenarios, such as a nuclear detonation, large numbers of people may need to relocate, perhaps permanently.

Complexity of Individual and Household Needs

Accommodating the broad range of human needs during a disaster is the central challenge in planning for effective housing assistance. Individuals and households have unique needs and circumstances that affect the choices they make, define requirements, and limit the disaster housing solutions that will be satisfactory. Planners must understand those needs and how they may change as a disaster unfolds. Planners must also anticipate how those needs will drive the demands for housing assistance, including who will need assistance and what types of assistance they will require. For example, individuals with special needs, including the elderly and persons with disabilities, or persons living with HIV/AIDS, may need physically accessible options, and convenient access to appropriate medical facilities or emotional support groups. To prepare to meet these diverse disaster housing requirements, planners must have detailed demographic data that reflects specific functional issues for disabled persons.

Community or Regional Characteristics

Effective housing assistance must be tailored to reflect the community or regional characteristics; one size does not fit all. Understanding community and regional characteristics is essential for planners to shape a disaster housing plan that reflects the appropriate types, nature, and location of housing assistance. One of the fundamental steps in disaster assistance is a high-level assessment of the area that has been impacted, including the extent of damage and how it has affected the community and surrounding area. This preliminary assessment helps establish priorities for housing assistance and provides valuable data to define the range of housing assistance required to meet the community’s needs. Communities

also need to address difficult questions about whether they will continue to rebuild areas that were damaged as opposed to permanently moving such housing to other areas at lesser risk.

Available Housing Options

The range of available housing options sets the parameters for the type of assistance that can be provided and challenges planners to be creative in seeking innovative solutions. Disaster housing must include a sufficient range of options that are compatible with the community characteristics, including population density, climate, geography, and land availability. They must be safe, durable, physically accessible, and cost effective. Viability may also hinge on timely availability and sufficient capacity to meet the size and diversity of a household, as well as cost-effectiveness.

In cases where residents may be able to return to their predisaster neighborhoods quickly, planners should make every attempt to create sheltering and interim housing options that allow individuals and households to remain near their predisaster residence. Planners should make the best use of available infrastructure, considering temporary housing only when needed. Yet when that need arises, the best plan will explore the full range of options, from factory-built housing such as manufactured homes and cottages to other creative alternatives which will meet the needs of a diverse community population. If the disaster results in conditions where the return of residents is expected to be months or years away, long-term or permanent relocation options should be reflected as an element of long-term planning.

Sheltering

In the face of an approaching disaster or after a disaster strikes, individuals and households may be forced to leave their homes to seek shelter. Providing shelters for disaster victims is a complex operation that requires collaborative planning across a wide range of organizations, timely decisions by local officials, and coordinated implementation among all involved, including nongovernmental organizations, the private sector, and various levels of government. Those involved in this process must balance the challenge of providing services with the urgency of meeting basic human needs.

Sheltering is typically conducted at the local level by nongovernmental organizations working closely with the local government to plan and operate facilities that meet local needs. When required, additional support is provided by the State and, if necessary, by the Federal Government. In most cases, shelter residents are able to return home within a short time or locate other housing on their own. However, in large-scale or catastrophic disasters, extended shelter stays may be required. As soon as shelters open,

officials must begin working to address longer term housing needs, ensuring that individuals can either return home or transition to interim or permanent housing. Shelters are not designed for, nor should they be used for, extended periods.

Shelters serve multiple purposes. Not only do they provide temporary refuge, but they also offer a place for families and households to regroup, register for disaster assistance, and obtain updates regarding damages, casualties, and response and recovery efforts. Shelters provide access to disaster recovery services that can help meet the immediate needs of individuals and households while the community responds to the disaster and begins the recovery process.

Individuals have a range of shelter needs that communities must be prepared to address. These individuals may have to make important sheltering decisions under difficult circumstances with less than perfect information and may face complicating personal situations. When communities develop comprehensive shelter plans, they provide options to meet those needs and various contingencies. The plans include accommodations for the general population and those with special needs, including persons who are elderly or have disabilities. Sheltering household pets must also be taken into consideration. Community needs will drive shelter configuration and the requirements for support services, specially trained staff, supplies, and equipment.

Individuals and Households

Baseline Capability: Individuals and heads of household develop and implement personal emergency response plans to meet their sheltering and personal needs (e.g., food, clothing, medications, important documents, and identification) during the first 72 hours following a disaster.

Local Government

Baseline Capability: Local governments designate an emergency manager who has the day-to-day authority and responsibility to work closely with the local government, nongovernmental organizations, the private sector, and the State to set requirements, develop plans, and obtain resources for those most likely to need shelter assistance.

As part of developing local emergency plans, the emergency manager works closely with community and nongovernmental organizations, such as the American Red Cross, the Salvation Army, and Citizen Corps Councils to meet the shelter needs of their community. Based upon a thorough assessment of the character and composition of the local community, these plans should define shelter requirements, identify suitable and accessible facilities, discuss key partners and their shelter responsibilities, and describe the support services that will be needed to meet community needs. Emergency managers should provide guidelines

for shelter operations and management, ensure adequate shelter capacity is available, and lay out procedures to ensure close coordination across shelters during a disaster. Shelter planning also includes developing public communication campaigns that support preparedness and encourage individuals and households to develop personal emergency plans. Preparedness campaigns also provide the public with information on evacuation routes and shelter facilities that may be used during a disaster, as well as items individuals should bring with them to an emergency shelter. Local emergency plans must be updated regularly and tested during exercises. Local governments must also prepare and disseminate information to assist individuals and households in developing their evacuation plans prior to an event.

States, Territories, and Tribal Governments

Baseline Capability: Governors of States and territories and tribal leaders designate or appoint a Director of Emergency Management as the lead official responsible for planning, developing, resourcing, exercising, and refining a State, territory, or tribal emergency sheltering plan that can be implemented to support and supplement local community sheltering or to coordinate shelter operations and resources across the State.

The designated State, territory, or tribal emergency management agency (EMA) establishes guidelines, policies, and procedures that aim at increasing collaboration, cooperation, and consistency in statewide emergency and shelter planning. The EMA coordinates with all agencies in the State to ensure that resources, including equipment, facilities, supplies, and personnel, are available to support shelter operations when required to do so. The State sheltering plan integrates nongovernmental organizations such as the American Red Cross and the Salvation Army and their resources, as well as private-sector resources. The State also coordinates among jurisdictions within the State to identify and fill gaps and develops mutual aid and assistance agreements. In time of emergency, the State may request mutual aid and assistance from other States though the Emergency Management Assistance Compact (EMAC), and coordinate with the Federal Emergency Management Agency (FEMA) to obtain Federal assistance.

Nongovernmental Organizations and the Private Sector

Baseline Capability: Nongovernmental organizations and the private sector provide indispensible sheltering support to States, territories, tribal governments, and particularly local governments. They provide expertise, guidance, toolkits, commodities, managers, and volunteers and fill leading roles in shelter management, both before and during disasters.

The mass care services of nongovernmental organizations are integral to the community's ability to provide and sustain sheltering services. Through coordinated efforts with State, tribal, and local emergency

management agencies, these organizations assist in determining sheltering requirements, providing shelter guidelines and assistance, and implementing shelter agreements. Organizations such as the American Red Cross and faith-based organizations provide sheltering and feeding services and should have preexisting agreements that allow them to quickly open shelters. In advance of and during a disaster, many private-sector entities provide resources to support sheltering operations. These partners contribute to local emergency planning; enter into agreements for technical assistance, goods, and services; and, in some cases, provide sheltering for their employees.

Federal Government

Baseline Capability: Under the Stafford Act and the National Response Framework, FEMA is responsible for coordinating Federal assistance to States in times of disaster through ESF #6 – Mass Care, Emergency Assistance, Housing, and Human Services. FEMA and key partners, such as the American Red Cross, the Department of Health and Human Services (HHS), and the U.S. Army Corps of Engineers (USACE), coordinate at the Federal and State levels, support shelter planning, develop and maintain capabilities to respond to requests from States, and play a leading support role when challenged by a catastrophe.

In most disasters where shelter services are required, the role of the Federal Government comes in two forms. First, through ESF #6 – Mass Care, Emergency Assistance, Housing, and Human Services, the Federal Government provides policy, guidance, and resources to support and build local and State capability4. Second, when the President declares a major disaster or emergency under the Stafford Act, FEMA, through its Public Assistance Program, may reimburse a portion of sheltering and mass care costs. In larger disasters, however, if sheltering requirements exceed State capabilities, the Federal Government must be prepared to respond rapidly to a Governor’s request for assistance. In some scenarios, including a catastrophic incident, the nature and magnitude of the disaster will increase the urgency and demand for Federal assistance.
Mass Care, Emergency Assistance, Housing, and Human Services, FEMA, as the coordinating agency, leads a host of supporting Federal departments and agencies, as well as members of the National Voluntary Organizations Active in Disaster, in preparedness efforts. The Federal Government can augment State and local services, such as feeding, shelter management, facility maintenance, security, emergency supplies, medical, veterinary, crisis counseling, family reunification, and other emergency assistance. This support, which has traditionally focused on areas impacted by the disaster, may also be required by nearby or distant States that agree to host evacuees. In a catastrophic incident, the Federal Government can also coordinate the availability of and transportation to shelters located in other States.

Current Practices

Current practices in sheltering focus on meeting the needs of individuals. Sheltering options can range from individuals managing their own needs by temporarily staying with friends or family to establishing emergency shelters for those who are unable to meet their own sheltering needs. All shelters should follow commonly accepted shelter operation guidelines, be staffed by qualified people (usually including a well-trained shelter manager and skilled volunteers), be connected to related community support services, and have effective and robust communications with local incident command staff.

Self-Sheltering

In many disasters, many people who are forced from their homes find temporary accommodations without assistance. They have emergency plans well before a disaster occurs and stay in motels, hotels, or with friends and family.

In some cases, local officials may direct individuals and households to "shelter in place" or stay indoors to reduce exposure to whatever hazard is threatening the area. In some parts of the country, people build "safe rooms" in their homes to protect them from tornadoes or other natural hazards. Shelter-in-place programs require advance planning, including public communications campaigns that encourage individuals and households to develop emergency supply kits with items such as water, nonperishable food, local maps, and battery-powered or hand-crank radios.

Emergency Shelters

Communities must plan for the eventuality that some residents will lack the means or opportunity to find their own temporary accommodations in a disaster. To meet this need, communities open emergency shelters. Shelters are planned and sites identified well in advance of a disaster. Not only do emergency shelters provide immediate refuge from a threatened or actual incident, but they also provide food, water, basic first aid, and access to community services. Emergency shelters can be designed for the general population or specialized to meet the needs of individuals who may require additional support.

General population shelters are typically managed by community organizations, such as the local American Red Cross chapter or faith-based groups. In large urban areas, the local emergency management agency may partner with these organizations to address the additional complexities of sheltering very large populations. The community organization that manages the shelter works closely with other community groups, such as service organizations, local fire and police departments, and local

businesses. Together they may provide additional support services, such as childcare or eldercare, recreational activities, and spiritual and emotional support, as well as pharmaceuticals, clothing, blankets, and personal hygiene items. These shelters are typically established at pre identified facilities such as schools, churches, community centers, and armories that meet specific structural and other requirements.

These shelters are designed to meet the needs of the general population, including persons with disabilities who can maintain their independence. Shelter planners work closely with the disability community, service providers, and other community groups to identify needs and provide appropriate accommodations in accordance with the Americans with Disabilities Act. Shelters must meet the physical accessibility requirements for persons with disabilities and accommodate service animals, since these animals are considered an extension of the person they serve.

Depending on the needs of the local population and the magnitude of the disaster, specialized shelters may be required. Communities analyze their populations to identify individuals who may require additional support and develop detailed plans for specialized shelters to meet those needs. The types of specialized shelters vary by community, State, or region. Selection of what type of shelter is most appropriate for an individual and household is based on functional needs, shelter availability and resources, and the preferences and needs of the individual. Following are examples of types of specialized shelters that can be established:

Medical Support Shelters: Local, State, or tribal governments, in coordination with public health and social services agencies, may establish medical support shelters for individuals who have medical issues requiring care beyond the capability of a general population shelter. These shelters provide a variety of medical services, ranging from extensive first aid, to medical assessment and monitoring, to primary care services. To meet the demands of major or catastrophic disasters, more specialized medical units may be established that include facilities such as operating rooms, decontamination services, delivery rooms, quarantine/isolation rooms, or mortuary services.

Medical support shelters are typically limited and admission is based on the level of care needed by individuals and the resources available within the community. Individuals may be interviewed regarding their medical needs and conditions to determine what shelter best meets their needs.

In major disasters, communities typically request assistance from neighboring communities and the State. If Federal support is required, the Medical Reserve Corps is one of the key resources to provide medically trained personnel. This type of assistance would be provided through the

National Response Framework under ESF #8 – Public Health and Medical Services.

Shelters for Use in Major or Catastrophic Disasters

Major or catastrophic disasters require more intensive sheltering support. When the demand for shelters exceeds capacity or traditional shelters are not available, planners and emergency managers may need to use nonconventional sheltering options, such as cruise ships, tents, vacant buildings, military barracks, dormitories, prefabricated structures designed for congregate settings, or campgrounds (such as scouting camps). In major or catastrophic disasters, not only will the number of people requiring shelter support be large, but extensive damage to structures and the infrastructure will likely limit sheltering options and result in substantially longer shelter operational periods. Decisions on whether to use nonconventional shelters are based on the total demand for shelter services and the post impact assessment of structures that meet shelter standards. Factors for determining appropriate types of nonconventional shelters include climate, open land for shelter sites, port access to bring in vessels for sheltering, access to transportation, and protection from immediate hazards. Nonconventional shelters must also meet the needs of people with disabilities. Given emergency or disaster circumstances and limited resources, shelters planners should work with persons with disabilities to meet their unique needs. For example, a veteran with post-traumatic stress disorder (PTSD) may request to be separated into a room/area with less activity and noise, or a person who uses a wheelchair may be able to use a temporary, nontraditional ramp.

Use of nontraditional shelters also requires additional monitoring for potential, unexpected problems that could arise with extended use of these structures, such as checking for chemical sensitivities, logistical issues, additional support services, or other issues. With sufficient planning and adequate resources, these nonconventional facilities can provide shelter for large numbers of individuals and households.

Shelter Needs of Facilities and Institutions

Hospitals, nursing homes, extended care facilities, jails, and other facilities offering institutional care are required by local and State law to have continuity of operations plans. These plans must provide for the continued care of residents during a disaster and meet specific requirements, such as identifying alternative facilities that provide comparable care, specialized transportation for residents, and procedures to inform relatives of the situation.

Local and State emergency managers should work with facilities owners to ensure plans and services meet the needs of residents, are well resourced, and can be implemented expeditiously and safely. Facilities owners should

also ensure that staff and resources are available to move, protect, and care for residents during a disaster

Facilities typically develop agreements with “host facilities” that provide a similar level of care, are located outside the risk area, and are willing to provide the support required during a disaster. Lack of preparedness on the part of the facilities may interfere with local emergency response and recovery, as resources must be diverted to cover the extraordinary needs of these facilities.

Transitional Shelters

When emergency shelters are no longer sufficient but traditional interim housing is not yet available, communities may use hotels or motels, and facilities such as arenas or convention centers may be altered to provide the additional space and privacy. In circumstances where demand exceeds capacity, nontraditional transitional shelters may also be used.

Lodging Reimbursement/Voucher Programs. Both government agencies and nongovernmental organizations provide lodging reimbursement programs that enable disaster victims to relocate into hotels or motels. Reimbursement is typically provided in the form of vouchers or payments made directly to participating facilities for short-term stays. These programs have the additional benefit of stimulating the local economy.

Facility Conversion. Emergency shelters and commercial or publicly owned facilities can sometimes be reconfigured to provide households with additional space and privacy by constructing temporary partitions. Converted facilities may also provide food preparation areas and bathrooms. It may take time to create design plans, obtain permissions from property owners, identify funding, and complete the necessary construction.

10.1.1 Town Planning after a Major Disasters

In India both civic status as well as demographic aspect is taken as criteria for declaring a settlement as urban. The Census of India 2001 defines an urban place on the basis of the following criteria:

- All places with a municipality, corporation, cantonment board or notified town area committee, etc.
- All other places which satisfy the following criteria:
  Minimum population of 5,000 at least 75% of male working population engaged in nonagricultural pursuits and a density of population of at least 400 persons per square km.

  (Tool Kit for Urban Planning)

When disasters occur in and around human settlements, their consequences are highly place-specific, revealing how a particular hazard interacts with and has consequences for the way humans have built upon and live in given locations. Once a disaster has occurred, the process of recovery challenges urban planning, a discipline charged with the management and ongoing improvement of our settlements, by presenting an opportunity to reconsider and improve upon a settlement's characteristics. We present in this chapter a way of thinking about urban planning during the recovery phase that is procedural, as well as being future-oriented to improved disaster resilience as an ongoing process A common approach used in recovery is the principle of "building back better." Oriented to a whole-of-community risk reduction approach, it also seeks to reduce the likelihood and consequences of future disasters, as well as rebuilding. It is intuitively logical as the possibility of ongoing losses from repeated events is very real. For example, in the United States the proportion of repeated payments under the National Flood Insurance Program is approximately 25% of the dollar value of payouts, despite being just 1.3% of the total number of policies held Establishing planning processes and governance that facilitate improved risk profiles during recovery is now understood as a core goal of disaster risk reduction.

A core goal of mature planning systems is to bring about advantageous spatial arrangements of all the physical and functional features in urban and regional areas. These might include housing, recreation, health services, infrastructure, transport, education, industry, and so forth (Halligan & Power, 1992). It is noteworthy that while this understanding tends to focus on physical matters, such as the design and location of structures, the purposes of planning are equally oriented to improving social, economic, and ecological outcomes via these physical processes

Many models of urban planning processes exist and these continue to be contested and refined over time. Importantly, the most enduring procedural model has its origins in the work of Patrick Geddes, known by the shorthand of Survey-Analysis Plan (Buxton, Goodman, & March, 2012). This was further developed by various others and applied at multiple spatial scales, for many purposes, notably Mumford (1968) who championed evidence-based strategic planning and action at the regional scale, Abercrombie (1943), and later Lewis Keeble at the metropolitan, town, and precinct scales (Keeble, 1952). The model at the core of these approaches is known as rational comprehensive planning (RCP), although diverse and important variants exist, notably systems planning (McLoughlin, 1969). The model was adapted to urban planning by Meyerson and Banfield (1955), seeking to reduce the negative influences of corruption, subjective values, and politics upon planning processes, in

favor of a more scientific and evidence-based approach. The key steps of RCP (as adapted in Keeble, 1952; Taylor, 1998) are:

1. analysis of situation and identification of problems/opportunities;
2. identification of alternative goals and objectives;
3. design of alternatives;
4. comparative evaluation and selection of alternatives against goals;
5. implementation;
6. monitoring of effects and adjusting goals or other parts of the process.

Even while RCP is periodically criticized, augmented, or ignored since first being developed in the 1950s, it remains relevant (Hoch, 1994; Levy, 2000; Sandercock & Kliger, 1998; Yiftachel, 1999, p. 21). It is noteworthy that the international standard for risk reduction processes Risk management – Principles and guidelines (ISO31000, 2009) is an adaptation of the RCP approach. Alternatives such as incrementalism (Lindblom, 1965) are more pragmatically based on the “reality” of managerial approaches that adopt the approach that ongoing adjustment to plans are needed. While perhaps appropriate in certain implementation processes, this approach is criticized for its complexity and attendant loss of strategic and collective oversight, and more fundamentally for its appropriation by various bureaucratic, political, business, or interest groups. While a popular approach as an ideal, the impacts of realpolitik often make this ideal implausible, although its use in plan making rather than implementation settings remains more realistic.

Planning using Evidence

In developed countries, the practices of urban planning use various sources of knowledge and evidence as a base for developing future directions, to provide guidance in recovery processes, with rational reasons providing legitimacy. Among these sources are various data sets, past experience, professional and personal knowledge, interactions with other agencies, decision makers, professionals, and community members to name a few (Krizek, Forysth, & Slotterback, 2009). This places the development, assessment, and application of various evidence as a core element of practice. Moreover, the holistic nature of planning requires a multidimensional approach to practice as it includes a range of different systems, at different spatial scales. Analogous to a living organism, any city consists of many diverse systems, such as transportation, water supply, infrastructure, waste removal, energy provision, housing supply, economic production, health provisions, and many others. These need to be integrated to be sustainable, particularly since considerable amounts of resources are consumed in developing and maintaining a city. Therefore, evidence in planning is core to justifying the multidisciplinary elements underlying the decision-making processes informing planning. For example, informed choices about the release of new land after an event in a

particular location will have implications for costs in terms of infrastructure, housing, affordability, distance to places of work, loss of habitat, requirements for new schools, health care, and so forth. Importantly, the nature of urban development may have implications for disaster risk management, meaning that hazards need to be fully understood and risk profiles developed for any proposed and existing settlements. This section briefly introduces evidence in planning and provides several examples with particular focus on hazard mitigation.

Governance and Recovery: Planning with and for others

Governance in democratic nations is generally understood as the wider set of processes that bring about collective outcomes, including but not restricted to, the formal agencies and institutions of government and often the public and interest groups (Healey, 1997). In this sense, it is also understood as being based upon good process that builds capacity in the wider citizenry in addition to a narrower view of "correct" decisions and outcomes. This wider view acknowledges the value of group learning, the development of trust, and the need to understand and acknowledge the views of diverse stakeholders. The processes of recovery, however, also place particular demands on the need for decisiveness and strong action, meaning that trade-offs need to be made (March, 2012). So while good process is important, it might not always be enough in disaster recovery. Recovery, and disaster management, is typically assessed against outcomes, as well as processes. An argument can be made that this is reasonable and what is expected by all the stakeholders in recovery.
(Blakely, Edward, 2017)

10.2 LIVELIHOOD AND COMMUNITY MICRO PLANNING

10.2.1 Economic and Livelihood Impacts

Major natural disasters can and do have severe negative short-run economic impacts. Disasters also appear to have adverse longer-term consequences for economic growth, development and poverty reduction. But, negative impacts are not inevitable.

Vulnerability is shifting quickly, especially in countries experiencing economic transformation - rapid growth, urbanization and related technical and social changes. In the Caribbean and Bangladesh there is evidence of both declining sensitivity to tropical storms and floods and increased resilience resulting from both economic transformation and public actions for disaster reduction. The largest concentration of high risk countries, increasingly vulnerable to climatic hazards, is in Sub-Saharan Africa. Risks emanating from geophysical hazards need to be better recognized in highly exposed urban areas across the world because their potential costs are rising exponentially with economic development.

Natural disasters cause significant budgetary pressures, with both narrowly fiscal short-term impacts and wider long-term development implications. Reallocation is the primary fiscal response to disaster. Disasters have little impact on trends in total aid flows.

Public policy implications

A full reassessment of the economic and financial impact of a major disaster should be made 18 to 24 months after the event that is then taken into account in reviewing the affected country's short-term economic performance and assistance strategy. Governments need appropriate risk management strategies for future disasters that include medium-term financial planning for 8 – 10 years. The basis of funding has to be broadened, applying a combination of mechanisms at different layers of loss coverage to help overcome the obstacles to increased coverage of insurance and capital market tools. Natural hazard risk management should be integrated into longer-term national investment policies and development strategies and appropriately reflected in the allocation of financial resources. Quality, reliable scientific information is a necessary condition for effective disaster risk management. The international community should support global and regional research and information systems on risks. It should also ensure that there are adequate complementary monitoring and dissemination programs at the national level. Priorities include climatic variability, regional and national flood forecasting and geophysical hazards.

Economic research on natural disasters

Vulnerability to natural hazards is determined by a complex, dynamic set of influences, such as economic structure, stage of development and prevailing economic and policy conditions. To understand and assess the economic consequences of natural hazards and the implications for policy, it is necessary to consider the pathways through which different types of hydro-meteorological (climate-related) and geophysical hazard impact on an economy, the different risks posed and the ways in which societies and economies adapt to or ignore these potential threats. The eclectic approach adopted in this study, employing largely qualitative methods, is particularly useful in exploring the many complex and dynamic pathways through which extreme hazardous events influence an economy and its financial system and also for identifying areas and issues where further investigation including quantification would be worthwhile.
(Charlotte Benson and Edward Clay, 2003)

10.2.2 Livelihood Options for the Vulnerable Groups Creating Self-Sustenance among the Disaster Survivors

Vulnerability is a broad concept, explaining not only income vulnerability but also those related to health, social exclusion and violence, all of

which can have dramatic effects on household livelihoods and community, regional as well as country development plans (Alwang et al. 2001). Vulnerability can be defined as the probability of an individual, household, region or country to be affected negatively by future events which are in themselves determined by the assets of the household, the correlation, frequency and timing of the shocks and the risk management instruments applied (Holzmann, 2001, Karin et al. 2001). In the development literature, vulnerability can be captured based on expected loss in utility, as expected poverty, assets based measures and as expected exposure to risks (Schechter, 2006). Vulnerability as expected loss in utility is defined as the difference between the utility derived from some level of certainty-equivalent consumption at times t and t+1. As expected poverty, vulnerability is defined as the probability that a household will fall in to poverty in the future. Using asset-based measures, it is defined as the probability of falling below some benchmark level of current consumption as a result of loss or degradation of assets. As exposure to risk, vulnerability is looked upon as probability of having an ex post welfare loss as a result of a negative shock (Alwang et al. 2001, Schechter, 2006, Raghav and Katsushi, 2008). In this study, vulnerability of households to future shocks is used as a proxy for livelihood insecurity. Household income and the total value of the selected household assets were used as a proxy for measuring future livelihood insecurity, in the case of effects from a simulated shock. The reason for using household assets is that shock affected households are very likely to draw on their assets in the process of recovery. Poorer households with fewer assets and entitlements are usually more exposed to the probability that shocks will make them poorer and thus livelihood insecure (Karin et al. 2001). Also, livelihood insecurity as a result of income and household assets is considered to present a better condition for analysis. Therefore, if the relative welfare loss of the household is large enough to push households into poverty or deeper in to a vicious cycle of poverty, these households are considered to be vulnerable to future shocks, and insecure livelihoods (Karin et al. 2001, Schechter, 2006, Armando, 2007). (Research Gate, 2015)

Check your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. What is the essential role of an individual in disaster response and recovery?

ii. How are an emergency Shelter designed?

iii. What is the role of Medical Support Shelters?

10.3 LET US SUM UP

To sum up, Increase our collective understanding and ability to meet the needs of disaster victims and affected communities, the collaborative work of the central, the Local and State emergency managers work with facilities owners to ensure plans and services meet the needs of residents, are well resourced, and can be implemented expeditiously and safely. Housing and Materialistic Support for the Disaster Survivors, Town Planning after a major disaster, Livelihood and Community Micro Planning, Impact of disaster on Livelihood and Economic Activities and Creating Self-sustenance among the disaster survivors is discussed in this chapter.

10.4 UNIT END EXERCISE

1. Write about Town Planning after a major disaster.
2. Explain the Impact of disaster on Livelihood and Economic Activities
3. Explain the importance of Creating Self-sustenance among the disaster survivors

10.5 ANSWER TO CHECK YOUR PROGRESS

i. Individuals have an essential role in disaster response and recovery that starts with understanding personal responsibilities and planning ahead. To increase preparedness, individuals should develop personal emergency plans for their households and pets, including planning for their own needs for the first few days following a disaster, such as medicine, essential documents, and drinking water and food.
ii. Emergency Shelters are designed to meet the needs of the general population, including persons with disabilities who can maintain their independence.
iii. Medical Support Shelters**:** Local, State, or tribal governments, in coordination with public health and social services agencies, may establish medical support shelters for individuals who have medical issues requiring care beyond the capability of a general population shelter. These shelters provide a variety of medical services, ranging from extensive first aid, to medical assessment and monitoring, to primary care services.

10.6 SUGGESTED READINGS

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UNIT XI - GENDER ISSUES IN DISASTER

Structure

11.1 SPECIAL NEEDS OF THE WOMEN

Women are integral parts of functioning societies, with established roles and rules. In order to address how people respond to emergencies and why they respond the way they do, we must highlight that responses are grounded in an existing social structure. Social structures not only provide the context, form and meaning for response, but are also a critical part of vulnerability. The vulnerability of women stems from cultural, political, and economic conditions. The poor and destitute are the most vulnerable, and they are disproportionately women and their dependent children. The organizational avenues through which people gain access to resources, social status, and even psychological well-being have an important bearing on perceptions of hazard, disaster mitigation and recovery.

The situation of women must be understood both in terms of their capacities – i.e., what they can contribute – and their vulnerabilities. Women should be seen as partners in formulating an emergency response for themselves and their dependent children, since disasters focus responsibility for children even more sharply on women.

Associations are built up in some societies to respond to particular needs. In many instances these associations are essentially voluntary. Often criteria are established to limit membership, or to address needs of particular interest groups. Many societies, especially in Africa, organize associations around interests and needs of women. For example, rotating credit associations ensure Nigerian rural women of the availability of cash to meet family financial needs (Okonjo, 1979). Unfortunately, the objective of such organizations can be compromised by male kinsmen who gain control of women's access to credit through pressure to market "surplus", thereby diminishing women's ability to provide for their children

11.2 PROBLEMS OF WOMEN AND CARE PROVISIONS

Highly vulnerable women have specific needs and interests before, during, and after disasters. Gender shapes capacity as well as vulnerability. Women are active and resourceful disaster responders but most often are regarded as helpless victims. There are a number of causes which are primarily responsible for vulnerability of people and social structure as far as occurrence of a natural disaster is concerned

The increased vulnerability of women, though primarily due to biological reasons, is also associated with factors which are socially and culturally deeply rooted in the community. They have to face different situations at various stages of disaster. After the immediate post-disaster period when adequate relief did not pour in, they have been bartered for food. In the late post-disaster period, girls may be married off at a much younger age or wedded to older persons, who may buy them under the guise of marrying them.

After a major disaster, it is seen that women are more prone to depression and other emotional disturbances. The psychological vulnerability of women predominantly arises from their inherent family instincts. After disaster loss of shelter and family poses a tremendous pressure. On occurrence of a natural disaster women are expected to play the role of care taker to the family without paying attention to their own losses. Feeding the children or other family members becomes their first concern and they immediately start getting involved in various activities. Thus, with trauma and stress added burden of duty and responsibility make the women more vulnerable to physical, mental and emotional stress.

It is supposed that men, are stronger both physically and emotionally but it is evident that women are better capable of handling emotionally charged issues, physical pain, and stress. Men think in the now, in present situation while women think more in the long term, big picture mode. When confronted with an emotional issue, women tend to look at how the resolution will affect those involved, while men usually look at the resolution itself as the end result. Men are more concrete thinkers, and women think on the emotional level due to differences in thought processes, women are better equipped psychologically to handle emotional situations than men.

11.3 SPECIAL ISSUES OF WOMEN IN HUMAN MADE DISASTER

Gender equality, or equality between women and men, refers to the equal enjoyment by women, girls, boys, and men of rights, opportunities, resources, and rewards. Equality does not mean that women and men are the same but that their rights, opportunities, resources, and rewards are not governed or limited by whether they were born female or male. Sexual

orientations distinctively define the roles, responsibilities, power, and privileges that females and males enjoy in any society, and traditionally this enjoyment is not governed by individual capacity. The concept of gender equality works towards reducing the equality gap between males and females, and that has been a priority in the UN Millennium campaign and the MDGs (United Nations 2013). Gender mainstreaming is a globally recognized strategy for achieving gender equality. The Economic and Social Council of the United Nations defined gender mainstreaming as "the process of assessing the implications for women and men of any planned action, including legislation, policies or programs, in all areas and at all levels" (United Nations 2002, p. 1). It is a strategy for "making women's, as well as men's, concerns and experiences an integral dimension of the design, implementation, monitoring, and evaluation of policies and programs in all political, economic, and societal spheres so that women and men benefit equally and inequality is not perpetuated" (IASC 2006, p. 12). Accomplishment of the MDGs with respect to women's empowerment is closely connected to the implementation of the IASC (2006) guidelines that are not only important for disaster response, but for the development of underprivileged women, who continue to live in poverty. This is described as the feminization of poverty (Moghadam 2005). Now, in the era of SDGs (Sustainable Developmental Goals), the agenda for women's empowerment is even more strengthened with the equal importance of environmental concerns that are the reason for intensifying disasters globally.

Although women's social, economic and political position in society makes them more vulnerable to natural hazards, they are not helpless victims. Women are important agents for change and need to be further strengthened as such. Recognizing and mobilizing their skills and capacities as social force and channeling it to enhance efforts to protect their safety and that of their communities and dependents is a major task in any disaster reduction strategy.

Indian women are the backbone of the rural subsistence economy. Their respective role in family which is of productive nature to a large extent makes the family and society sustainable but it is not acknowledged by and large. Women's work in agriculture is often seen as an extension of their domestic responsibilities, rather than a separate economic activity. In rural areas which are more vulnerable to natural hazards since rural population depend more on the natural resource base for all aspects of life. Securing food, water and fuel are key community concerns, which are predominantly taken care of by women. There are many examples of women's informal community involvement in disaster reduction, but women are still largely excluded from formal planning and decision-making and need to be empowered to do so effectively. This is essential to ensure effective disaster reduction policies. If some decision-making is shifted Emergency relief and aid processes particularly disadvantage

women who must organize food provision, shelter, and child and family care according to chaotic aid-delivery systems and entitlement procedures that rarely take their work or opinions into account. Although women commonly organize themselves to distribute supplies, establish shelter, and pool labor and resources to create community support services to meet basic family needs in the emergency period, their efforts are often invisible or go unacknowledged.

Indian women face a number of hurdles in applying and qualifying for aid after a disaster this primarily because of illiteracy or limited literacy, limited access to information on how to apply and navigate the bureaucracy in addition to the eligibility requirements. In majority of instances it has been found that relief and rehabilitation schemes favor men over women, where priority has been given to property owners, tenants of record, bank-account holders, and perceived heads of households. Women's economic condition becomes critical because in large number of cases employment assistance concentrates on workers in the formal economy and business aid is awarded to formal enterprises.

Post disaster aid and investments generally undermine women's collective capacity to surmount day-to-day problems adversely affecting the economic base of women. There is no consideration for women's productive and reproductive activities as far as conventional disaster response in India is concerned, It is not at all reflect how important housing and informally held resources and assets are to women's security. The impact of disaster on women's day to day work is great. In such a situation generally support systems such as child care, schools, clinics, public transportation and family networks are disrupted or destroyed, resulting in an increased domestic work. They have to face loss of workspace, tools, equipment, inventory, supplies and markets or even domestic violence.

It has been noticed that women's groups that participate in emergency relief, resettlement, and reconstruction efforts following a natural disaster acquire significant knowledge and expertise that can greatly benefit communities that subsequently experience similar crises. When mechanisms are established for promoting the transfer of this knowledge from community to community, poor women are enabled to come out of their homes and form groups to assess their situation, organize, and participate in the range of decisions and programs. When disasters strike, the opportunities to decrease women's marginalization arise early on, when norms of social control and male-dominated family structures are temporarily disrupted and weakened by the chaos that ensues. If affected women can meet and benefit from the experiences of other women who have managed to deal successfully with disaster- related issues, much valuable time can be saved and mistakes avoided. Gender issues must be urgently and effectively integrated into disaster research, planning, and

organizational practice. Women Have a definite role to play in disaster relief and reconstruction activities. Considering this a new approach to disaster needs to be developed out and disaster research, planning and practice should look into their vulnerabilities and requirements.

Whether disasters or conflicts, the impacts are much higher for women than for men (ADPC 2010). The impacts of disasters increase the magnitude of preexisting development issues and are not just dependent on the natural hazards that are part of the environment. Different sociopolitical factors exist within society before a disaster and cause serious vulnerability among women. Disasters expose this vulnerability to a larger extent—often destroying progress towards the MDGs. Women's vulnerability is connected to their generally lower socioeconomic status. Women usually do not hold property or land rights, have less political voice, fewer educational opportunities, and less mobility due to cultural restrictions. In India cultural practices like the *purdah* system (the seclusion of women) that does not allow girls to go to school, marrying girls at an early age, the dowry system, and patriarchal practices limit the opportunities for girls and women.

A fact-finding mission on the 1984 Bhopal gas leak disaster, one of the world's worst industrial disasters, after 17 years revealed that mental trauma continued among survivors, and as a group women were more affected than men. Women had significantly higher functional disabilities and suffered from various forms of violence, abuse, and harassment (Basu and Murthy 2003). The women who had traumatic experiences during the 2002 Gujarat communal riots and conflict had problems like reexperiencing the traumatic events, accompanied by symptoms of avoidance (staying away from reminders, avoiding the thoughts of the traumatic incident) and hyperarousal (felling restless, pounding of heart, breathlessness) as described in impact of event scale (Horowitz et al. 1979). Lack of mainstreaming of psychosocial support and the problem of rebuilding support mechanisms are major areas of concern in facilitating the well-being of women survivors, in particular (Kar 2010). More women depend on domestic activities and an informal economy, and displacement, loss of household resources, and lack of adequate support affect them more than men. Like in other developing economies, men tend to migrate for jobs, and women are tied up with their traditional responsibilities and face greater economic insecurity after disasters. The breakdown of the traditional family and community-based support systems disproportionately impact women after disasters.

11.4 ROLE OF THE WOMEN IN ORGANISATIONS AND GOVERNMENT

Disasters have had an impact on the lives of women all around the world. Generally women are looked at in disasters only as victims despite the fact

that the majority of victims in disasters are women and children. The central role of women in facing the aftermath of disasters is totally neglected. India is one of the most vulnerable countries to natural disasters. The country has faced a number of natural disasters in the last decade which have claimed hundreds thousands of precious lives and heavy economic losses. It has been observed that more than half of the victims in the past disasters were women. During the last major natural disasters of the decade it has been observed that in India women do not have technical knowledge about disaster occurrence in general. The participation of women in the planning, designing, implementing and monitoring emergency programs and rehabilitation projects is still on a low key profile. Present paper discusses the position of Indian women and role played by them in past natural disasters. Based on survey and study of 2004 Sumatra Tsunami affected areas of Tamil Nadu, India it will put forth the problems and difficulties Indian women face during and after occurrence of a natural disaster. It endeavors to suggest strategies to train and educate them to make them capable of performing their expected duties in such an event. It also defines their responsibility and input which they can offer for inculcation of disaster safety culture amongst the society.

In Maharashtra and Gujrat states of India a number of nongovernmental organizations involved who encouraged local women to participate in relief and recovery operations after earthquake occurrence. They made various groups to build the skills and capacities required to train the members for post disaster recovery to long-term development. The remarkable work by an Ngo called Swayam Shikshan Prayog (translated as "learning from one's own and others' experiences") which had more than 15 years experience of working for women and poor communities in rural India proved the capability of women in handling disasters. In 1993 Latur Maharashtra earthquake, they contributed in repairing and strengthening of damaged houses. In 2001 Bhuj, Gujrat earthquake the grassroots women's groups from Maharashtra traveled to this neighboring state to share experiences and pledge long-term assistance. Swayam Shikshan Prayog (SSP) was established as an NGO to build the capacities of rural women's groups to access and manage development resources and to participate in decision-making processes affecting their families and communities. In year 1980 they developed in a pilot collaborative effort with the government to enhance women's economic participation in an existing antipoverty program, funded by UNICEF (the United Nations Children's Fund) and the national and state governments. SSP facilitated a dialogue between community-based women's groups and local government officials in six districts in the Marathwada region of Maharasthra State. During this period, SSP piloted methods such as district wide information fairs and community-to-community exchanges and dialogues for women designed to help them to learn to work with banks and government agencies. Today SSP, with a staff of more than 60, partners with women's collectives and communities across 889 villages, including 1,680 savings and credit

groups that represent more than 22,000 female members. These women's groups address urgent issues such as credit, food security, water and sanitation, health, education, and social infrastructure by initiating demonstration projects, community planning, and skills training, and by increasing their participation in local governance. To support these efforts, SSP, with headquarters in Bombay, operates field centers in the Maharashtran districts of Amaravati, Beed, Latur, Nanded, Osmanabad, Solapur, and the Gujarat districts of Jamnagar and Kutch.

Women must be positioned as active stakeholders and decision makers in DRR efforts and not only as a human and economic resource for DRR. Women leadership is further facilitated when they are systematically included and informed and when their participation is supported. This means removing barriers for women to voice their needs and priorities, to access and use of information, capacity development opportunities, training and prioritization of formal and informal education on disaster risk reduction. . This can be facilitated by: Institutionalization of quota systems or gender parity in DRR decision making processes and interventions; Enhancing women's equal access to information, including early warning, training, education and capacity building to strengthen their self-reliance and ensure the implementation of gender-responsive public information and communication systems; Prioritizing education as a critical entry point to engage girls in DRR and engage boys as allies in addressing barriers that prevent the participation of women and girls in DRR; Mediating constraints on women's time, mobility and security impeding their participation in DRR (e.g. by providing support to women's other responsibilities so they are not overburdened but have time and opportunity to participate in activities).For example: safe transportation and child-care support is provided; activities and meetings take place at times that are convenient to women; women are compensated materially for the time and skills they contribute; Ensuring women's legal entitlements and practical access to assistance and services in relation to disaster risk management such as basic health services, including sexual and reproductive health, compensations, cash transfers, insurance, social security, credit, employment.
(Vasudha Gokhale, 2008) (UN World Conference on Disaster Risk Reduction, 2015) (Subhasis Bhadra, 2017) (Winnipeg, Manitoba, 1994)

11.5 SPECIAL NEEDS OF THE MEN GROUPS AND VULNERABLE MEN WORKING WITH PRI FOR PSYCHOSOCIAL CARE OF THE MEN

The psychosocial caregivers need to have skills to work with people as individuals and then in groups. They need to have skills to work with women, men and children as well. Skills for working with the aged, the disabled and then those who have faced physical or sexual violence need to be developed. The caregivers need to be sensitive to the special needs of

these groups in order to reach out to them in a meaningful manner. This section looks at the special groups the workers would need to focus on.

Working with Individuals

At the first level they would need to start reaching out to individuals, finding spaces and time to sit with them and help them ventilate and share their experiences of the disaster. This would enable the worker to develop a rapport with people and form the basis for group work that would be undertaken at a later stage.

For people who are willing to talk immediately:

- Listen attentively.
- Do not interrupt.
- Acknowledge that you understand the pain and distress by leaning forward.
- Look into their eyes.
- Console by patting on the shoulders or touching or hold their hand as they cry but be sensitive to community norms about touching members of opposite sex.
- Respect the silence during your interaction; do not try to fill it in by talking.
- Keep reminding them,' 'I am with you". Its good you are trying to release your distress by crying. It will make you feel better.
- Do not ask them to stop crying.

  For those unwilling to talk Some people may be very angry or remain mute and silent. Do not get upset that they are not talking. Remind them that you understand how they feel, the pain and suffering they are going through. 'It is true that pain is so much that you feel there is no point in talking about it. I can imagine how you must be feeling.

- Do not get anxious or feel rejected. Remain calm; tell them you are here to help them in the best possible way.
- Maintain regular contact and greet them. Ask them about their welfare.
- Maintain interaction by reminding them about -pain of separation, distress of being alone, helplessness, isolation etc. This will help them to feel their pain and get it out of their system.
- Acknowledge that you understand their distress; the frustration, emptiness and also the subsequent anger because of the vacuum created by the loss.

- Share their grief and console them that losing someone dear is terrible and unfortunate.
- Make them understand that they are not to be blamed for the tragedy and need not feel guilty.
- Tell them you will return the next day or in a couple of days.
- Tell them you are not upset or angry because he/ she did not talk. Meanwhile ask him/her to think about whatever has been told. "Memories of good days you spent with each one must be alive in your mind and coming to your mind again and again. You must be tense inside! Try and let the steam out, that will make you feel better."

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. Expand a) UNICEF b) SSP

ii. Write about SSP

iii. Write about psychosocial caregivers

11.6 LET US SUM UP

Disasters have had an impact on the lives of women all around the world. Generally women are looked at in disasters only as victims despite the fact that the majority of victims in disasters are women and children. The central role of women in facing the aftermath of disasters is totally neglected. Gender issue in disaster is discussed in detail in this chapter. The mostly affected vulnerable group is women and children. There is a special Needs of the Women, the Problems of women and care provisions, Special Issues of women in human made disaster, Role of the Women in Organisations and Government and Special Needs of the Men Groups and Vulnerable Men Working with PRI for Psychosocial care of the men are the major part focused here.

11. 7 UNIT END EXERCISE

1. Explain the Special Needs of the Women at the time of disaster.
2. Write about Special Issues of women in human made disaster.
3. Highlight the Role of the Women in Organisations and Government

11.8 ANSWER TO CHECK YOUR PROGRESS

i. a) UNICEF - United Nations Children's Fund. b) SSP- Swayam Shikshan Prayog.

ii. Swayam Shikshan Prayog (SSP) was established as an NGO to build the capacities of rural women's groups to access and manage. development resources and to participate in decision-making processes affecting their families and communities.

iii. The psychosocial caregivers need to have skills to work with people as individuals and then in groups. They need to have skills to work with women, men and children as well. Skills for working with the aged, the disabled and then those who have faced physical or sexual violence need to be developed. The caregivers need to be sensitive to the special needs of these groups in order to reach out to them in a meaningful manner.

11.9 SUGGESSTED READINGS

Smith, Oliver A, 1999, "Peru's Five Hundred Year Earthquake: Vulnerability in Historical Context," Oliver Smith A and S. Hoffman (Eds), The Angry Earth, Rouletdge, New York.

Talwar, Prem P, "Urban Scenario in Asian Countries" at http://www.auick.org.

Yodmani, Suvit, "Poverty, Vulnerability and Disaster Risk Reduction for the Poor", on line at Asian Disaster Preparedness Center (ADPC) web site.

UNIT XII - SPECIAL NEEDS OF THE CHILDREN AND ADOLESCENTS AND THE VULNERABLE GROUPS STRUCTURE

Structure

12.1 ROLE OF CHILD CARE PERSONNEL FOR THE CHILDREN & ADOLESCENTS AND THE VULNERABLE GROUPS

Many children under the age of five spend their daytime hours away from their parents. Most of these children are in a child care center/child care home. Emergencies occurring during hours of operation require pre planning. A child care center/child care home director's primary responsibility is assuring the safety of children in their care. Therefore, it is imperative to have a comprehensive written disaster plan, commonly referred to as the Emergency Operations Plan (EOP) with policies and procedures to be followed when a disaster occurs. All child care center/child care home disaster plans should incorporate the four areas of disaster management: prevention/mitigation, preparation, response, and recovery. The plan should be developed with input from parents, child care center directors and personnel, and local school district (if child care center is part of a school), and should be reviewed periodically. Recommendations are that the plan should be drilled once a month using different potential emergency situations. This section will review how the four areas of disaster management should be applied in the child care setting.

Prevention/Mitigation

Prevention/mitigation involves taking steps to reduce the risk and effects of a potential disaster. Mitigation is an ongoing effort that addresses the implementation, management and maintenance of prevention strategies. This process includes the following steps: Identify hazards and risks.

- ♦ Develop plans to address specific hazards and risks.
- ♦ Identify necessary preventative strategies.
- ♦ Develop response plans.
- ♦ Implement corrective programs.
- ♦ Reassess to assure whether correctional measures were effective.
- ♦ Make necessary adjustments in emergency/disaster plans.

Hazard and Threat Assessment

A key mitigation activity is to determine which hazards and disastrous events are most likely to occur in your area or in your child care center/child care home. This process is referred to as a Hazard Vulnerability Assessment (HVA). Hazards can exist in your child care center/child care home building, on the property immediately surrounding your center/home, and in the neighborhood, community and state where your center is located. It is important to consider all four of these areas when looking at the vulnerability of your child care center/child care home. Identifying the hazards that your child care center/child care home is most vulnerable to or that are most likely to occur can guide your emergency preparedness planning activities. Conduct a survey of your internal center/home for potentially dangerous placement of furniture, fixtures, loose blinds, windows, etc. Fix any dangerous situations that are discovered.

- Move cribs away from the top of stairs and other places where rolling could endanger them or where heavy objects could fall on them.
- Ensure whiteboards, smart boards, and bulletin boards are securely mounted to the wall. Heavy furniture and televisions should also be mounted to the wall.

Walk around the outside of your center/home and evaluate the structure for possible hazards, such as instability in a wall which could create its own disaster during an event, such as a tornado or an earthquake. Be aware of nearby structures and industry within your area that could be sources of hazardous materials, such as overhead power lines, or nearby industrial plants. Identify if there are hazardous material transportation routes that run near your child care center/child care home. In addition, identify what hazards are common in the state where your center/home is located, such

as certain types of natural disasters. Examples of questions to ask during this assessment include:

- Can your center/home withstand a tornado, earthquake or other natural disasters that are common in your area?
- What would the magnitude or intensity of the impact be on your center/ home should an event occur?
- Is your center/home prepared for power failures, or to respond to water contamination from a hazardous material leak?

To obtain information about your community when performing your HVA, contact your local emergency services agencies and governmental offices (e.g. local law enforcement, local fire department, city or county emergency management agency, the city planning office). Discuss with these agencies what plans are in place for dealing with possible/probable disasters in your community, how to integrate your child care center/child care home plans into their planning and identify how your center/home will be made aware of disaster events.

Other Prevention/Mitigation Activities

Other mitigation activities include:

- Get to know your neighbors and community partners since they may be able to respond and assist during an emergency event.
- Discuss and establish mutual aid agreements with neighbors and community partners for safe emergency shelter in the case of evacuation.
- Set up agreements with community partners to provide needed services in the event of a disaster. For example, an important agreement to establish is with the local transportation company to provide bus service in the event of an evacuation. These types of agreements should be in writing and are called a Memorandum of Understanding (MOU). See Appendix 2 for a sample MOU template.
- Send out reminders to parents/guardians to maintain up-to-date contact information.

Preparation for emergencies involves developing a well thought out disaster plan that is practiced through the conduction of drills and ensures the availability of resources to respond to an event.

Roles and Responsibilities within the Child Care Center/Child Care Home during Disasters

This section outlines the different roles and responsibilities that staff at child care centers/homes need to perform while planning for and responding to a disaster. For child care homes that may have fewer staff than larger child care centers, these roles/positions would need to be shared among the available staff.

Incident Command System the Incident Command System (ICS) is a standardized, all-hazards approach to managing disasters that:

- Allows for the integration of facilities, equipment, personnel, procedures and communications to operate within a common organizational structure;
- Enables a coordinated response among various jurisdictions and functional agencies, including public and private;
- Establishes common processes for planning and managing resources;
- Is flexible and can be used for incidents of any type, scope and complexity;
- Is used by all levels of government as well as by many nongovernmental organizations and the private sector, and is applicable across disciplines.

ICS is extremely useful as it not only provides an organizational structure for incident management but it also guides the process for planning, building and adapting that structure. Using ICS for every incident or planned event helps hone and maintain skills needed for large-scale incidents. It is recommended that you and your staff become familiar with the overall concepts of ICS, which will assist in interacting with emergency responders during a disaster or emergency event. The Federal Emergency Management Agency (FEMA) offers free online courses that are available to assist you and your staff in learning the Incident Command System. More information can be found at: http://training.fema.gov/IS/crslist.aspx. One of their courses focuses on child care center preparedness and is titled IS-36: Multi-hazard Planning for Childcare. Within the Incident Command System, there are five main positions: Incident Commander, Operations, Planning, Logistics, and Finance. On the next page is a table that provides definitions of each of these five positions, examples of how the ICS positions may fit into a child care center and examples of duties each position may perform during an emergency/disaster event. For child care homes that may have fewer staff, these roles/positions would need to be assigned among the staff that are available.

Everyone has a Role in Disaster Planning and Response

The Child Care Provider or Director

- Conducts a hazard vulnerability analysis (HVA) and identifies potential disaster situations.
- Coordinates repairs of potential dangers identified during the HVA with building management and maintenance personnel.
- Develops (with the help of a planning team) the disaster plan in conjunction with local emergency management officials.
- Assures that staff and children are trained/prepared to respond.

- Assigns emergency responsibilities to staff members. (e.g., assign a specific person to maintain and transport pertinent files which include children's names and contact information, medical information, photos as well as employee emergency information in the event of an evacuation).
- Secures necessary training for staff members (CPR and First Aid).
- Conducts drills and initiates revisions to the disaster plan based on drill evaluations.
- Keeps parents and staff members informed of emergency plan revisions.
- Conducts periodic safety checks of the physical center/home, equipment and vehicles.

The Child Care Center/Child Care Home Staff

- Participate in developing the disaster plan.
- Know and understand their role and responsibilities during an emergency situation.
- Participate in emergency preparedness training and drills.
- Assume responsibility for taking emergency supply packs with them in the event of an evacuation.
- Know locations of the main shut-off valve for water, main utility box for electricity and main gas valve.

During a Disaster:

- Place an identification bracelet on each child or pin information on each child (e.g. to the back of their shirt) that will help reunite the child with his or her parents/guardians or other trusted individuals.
- Assign an individual (staff member or assistant) and a backup person to be responsible for each child's safety during the event.
- Release children only to individuals the parents/guardians have designated as approved to take the child from the child care center; require such individuals to show photo identification before releasing a child to them.
- Keep parents/guardians informed when children are evacuated from the child care center/child care home.

After a Disaster:

After an incident has occurred, it may not be possible to locate a child's parent/guardian or other designated trusted individuals. The child care center/child care home will need to keep the child safe until reunified. Child care centers/ homes should contact the local emergency management office, the state child care licensing office and National Emergency Child

Locator Center (NECLC) operated by the National Center for Missing & Exploited Children (NCMEC). If possible, provide requested information such as a photo of the child and parent/guardian information. If no one has been located to release the child to and the center is no longer able to provide care for the child, follow local protocols and contact the appropriate state agency for guidance.

12.2 EMPOWERING CARE GIVERS AFTER THE DISASTERS

States like Arkansas are promoting the use of home-based health care and community-based services as a way to help people manage the high cost of traditional medical services while continuing to live as independently as possible. These services can include personal care, health and mobility support, housekeeping assistance, therapy, socialization, and respite care. In addition to the cost-effective benefits of community-based services, those with special needs can also expect more freedom and better care in a home or community-based setting.

The trend towards community-based services away from institutional services is growing according to recent Medicaid reports: 51% of Medicaid expenditures in long-term health support went to home and community-based services (HCBS) between October 2012 and September 2013. This means that of the $145 billion spent in long-term care programs, $75 billion was allocated to community-based options. 49% was used the year before, meaning these programs now account for more than half of Medicaid spending in this arena.

1. Cost-Effectiveness

Medicaid is spending more on community-based services for long-term health support for a reason. A study released in 1999 compared those receiving conventional (institutionalized) care with people receiving mobile medical care (community-based services). Results showed that the community-based serviced group experienced a 50% reduction in expenses and a 65% reduction in the number of days they spent in a hospital.

Results of a Nevada house call program published in *Annals of Long Term Care* reported a 62% percent reduction in hospital days and savings of $440,000 annually when 91 clients utilized community-based services instead of institutionalized services.

In Arkansas, the benefits of home and community based care can be seen in the case of an elderly woman enrolled in ElderChoices. If she had entered a nursing home, Medicaid would pay close to $50,000 a year for her care. By choosing ElderChoices, the cost is under $7,500 per year.

2. More Choices

Institutional care of anyone with a physical or intellectual disability significantly reduces that person's ability to make their own choices and interact with others. This is because most continuing care facilities

structure their operations and activities around staff rotations rather than patients' schedules. Patients spend more time lying in bed alone rather than interacting with others or receiving care.

Community-based services and home care services allows individuals to remain independent and have more control of their daily schedule. This way, they can maintain desired relationships with family members and friends while getting the daily assistance they need. Home care providers take the time to give their clients the emotional and physical support they need in contrast to the understaffed or underfunded institutions housing hundreds of people.

3. Better Care

The cost of institutionalized care has never been proportionate with the level of care it delivers, nor the outcome of such care. Although a house call by a specialized health professional may cost more than one trip to physician's office, research shows that individuals receiving daily assistance and care in their own homes are less likely to make multiple visits to the ER or require frequent hospitalization.

Prevailing evidence shows that those transitioning from an institutional setting to a program with the benefits of community-based services see continued development of their daily living skills. Alternately, those remaining in institutional care do not experience positive growth in their abilities. They instead remain at or below the level of skills they had when initially admitted to a long-term care facility.

Integrity, Inc. has been providing compassionate, home care and community based services in Arkansas for over 25 years. Contact Integrity to take advantage of the benefits of community-based services at 501-406-0442 and find out more about our programs.

Long-term Care Settings and Services:

LTC can be delivered in institutional settings like nursing homes, or in the community in the form of HCBS.

HCBS refers to services of variable frequency and intensity provided in a wide array of non-institutional settings, from recipients' own homes to various congregate living arrangements. Care provided through HCBS may be pieced together from multiple agencies and independent providers with or without overall coordination or management. Both the nomenclature and the nature and scope of services vary tremendously between settings. For example, the continuum of facilities and services included under assisted living (AL), a particular category of HCBS, blurs the boundaries between institutional and non-institutional care. In general, AL is provided in independent apartments for seniors, which offer substantial privacy and control for residents; but some AL (especially for those with severe cognitive impairments), is provided in more regimented

environments. Even with the rest of the population served, the level and intensity of supportive services varies widely. Conversely, some models of congregate group housing seem closer to institutional settings. In light of these complexities, HCBS must be clearly defined and conceptualized.

Sample list of Home and Community-based Services:

- Care coordination or case management
- In-home services (provided in recipients' own homes)
  - Personal care assistant service
  - Personal attendant service
  - Homemaker agency and personal care agency services
  - Home hospice services
  - Home delivered meals
  - Home reconfiguration or renovation
  - Medical services
  - Transportation
  - Cash payments or allowances managed by the consumer or a consumer representative to pay for above services
- Services provided in congregate living settings that are expected to be the recipient's home, such as assisted living, adult foster homes, small group homes, and residential care facilities
  - Cooking, housekeeping, mobility assistance, which are all services provided by personal care assistants and personal attendants or home health aides under HCBS (could be consolidated as restaurant service as well as in-home services in the resident's unit)
  - Personal care (could include medication administration, medication) management
  - Activity program
  - General oversight and safety supervision
  - Wellness assistance and health monitoring
  - Palliative care
- Services provided outside the recipient's home (regardless of whether it is a private home or a group residential setting)
  - Adult day care
  - Day health care
  - Senior center programming

Compared to HCBS, NHs are relatively easy to define. Nursing homes are institutional facilities licensed by the state that offer 24-hour room and board, supervision and nursing care. However, NHs have multiple functions and serve distinct populations tied to specific funding streams. For example, NHs serve not only long-stay residents (the population of interest to this review), but also short-stay residents who receive rehabilitation or post-hospital recuperation. A list of services in nursing homes might include:

- Personal care, ADL services
- Medication management and administration
- Nursing management, restorative nursing
- Palliative care
- Meals
- Rehabilitation
- Activities
- Transportation
- General care coordination, care planning, oversight

Comparing HCBS to NH:

Apples-to-apples comparisons and meaningful evaluations of outcomes between HCBS and NHs are challenging. Meaningful comparisons must include services of roughly equivalent type, frequency, and intensity. Comparisons of HCBS and NHs are complicated by heterogeneity.

Heterogeneity in Long-term Care Recipients

LTC serves older adults with varying degrees of physical and mental disability and/or chronic illness, as well as younger individuals with impairments that create a need for assistance with ADLs and IADLs.[3] Therefore, LTC recipients include those with a disability acquired as a concomitant of aging and those with long-standing or even congenital disability who may have entered LTC earlier in life and are aging within the system. Ultimately, LTC recipients require a wide range of assistance with tasks of daily living. Any comparisons of NH care and HCBS will require an understanding of actual comparisons made by investigators—i.e., the characteristics of those served and the service mix in both the NH and the HCBS. In general, HCBS clients should be compared to long-stay NH residents. Even still, measurement issues further confound the effort to compare case mixes between institutions and community care. For example, researchers may use IADLs for community samples but would not see them as applicable to nursing home residents.

Heterogeneity in Long-term Care Settings and Services

LTC is provided in a range of settings (physical and social environments in which care is provided), and these settings are integral to LTC delivery. The appropriateness of a particular setting for an LTC recipient is based on a complex interplay between the characteristics of the individual, the settings, and the services.

Further, the type, frequency, and intensity of LTC services vary across settings and within settings. HCBS includes a wide variety of settings and services. A particular problem is classifying AL, which, although institutional, is generally more restrictive with fewer services than NH.

Assessing the Cost of Care

Assessing costs in the context of LTC requires attention to expenses associated with several factors, including housing; specific services delivered; health care utilization (including acute care services such as hospitals, emergency departments); and, finally, costs incurred by recipients and their families. Meaningful cost comparisons between HCBS and institutional care must determine and specify the exact costs being counted. For example, NH care includes room and board while HCBS care does not. Meanwhile, some cost analyses of HCBS include all public subsidies received by HCBS clients (e.g., rent, transportation, and food stamps), arguing that these are not accrued by NH residents. (U.S. Department of Health & Human Services, 2011)

12.3 METHODS OF WORKING WITH CHILDREN AFFECTED BY DISASTER

Needed Focus on Children and Families

There are tremendous deficiencies in the data needed to plan appropriately for children, said keynote speaker Redlener, and as a population they do not have their own voice to use to their advantage. Children have very long memories, he continued, and the impact of the trauma associated with both the disaster itself, and prolonged or difficult recoveries, can last a very long time.

Lessons Learned Versus Actions Taken

People often look back at their experiences and call them “lessons learned.” But Redlener highlighted the need to differentiate between something that happened, and something that happened that led to preventive actions to mitigate future adverse events. He offered several examples from the events that occurred between October 24, 2012, and May 31, 2013. During this 7-month period, there were 9 major incidents: Hurricane Sandy on the East Coast; the Sandy Hook Elementary School shooting in Newtown, Connecticut; bombings at the Boston Marathon; an explosion in a fertilizer plant in West, Texas; letters containing Ricin

mailed to officials in Washington, DC; massive flooding in the Midwest; two EF5 tornadoes within 2 weeks in Moore and El Reno, Oklahoma; and a bridge collapse in Mount Vernon, Washington. Four of these incidents happened in 1 week, between Monday and Friday of April 15 through April 19 (Boston bombings, West explosion, DC Ricin letters, and Midwest flooding).

Children's Near Misses

Data are difficult to obtain, but it is estimated that across these 9 events there were 176 fatalities, 46 of which were children or adolescents (26 percent). Redlener also described some of the “close calls” in these events, situations that could have easily been far worse with respect to child injuries and fatalities. For example, during Hurricane Sandy, the New York University Langone Medical Center evacuated neonates from its neonatal intensive care unit. Photographs of people carrying tiny newborn babies down a dark hospital stairwell were front-page news. While evacuation helped to ensure continued intensive care, Redlener suggested that, had we learned from Hurricane Katrina and taken action to protect generators, fuel supplies, electrical systems, etc., there may not have been a need to move these delicate patients. In Boston, there happened to be very few children at the marathon finish line when the bombs detonated. What if, Redlener said, there had been a third-grade class watching the end of the marathon at that time? In West, Texas, the plant explosion caused extensive damage to the middle school and high school. Because the explosion happened after school hours, the middle school students were gone, and although the high school track team was returning to the school from an event, they decided to stop along the way for something to eat, delaying their return to school. Although hundreds of schools are in Oklahoma's “Tornado Alley” (most without appropriate storm cellars or other safe havens), the Moore, Oklahoma, tornado only destroyed one school (killing seven people in the school). In Mount Vernon, Washington, there were no children in the vehicles that plunged into the water when the bridge collapsed. Thankfully, there was not a school bus on the bridge at that time, he noted.

Turning Learning to Action

The questions, Redlener said, are what are we actually learning from these events and near misses, and how fast are we filling the gaps in preparedness and response that are identified? During only 215 days the country faced a hurricane superstorm, a school shooting, terrorism, an industrial accident, severe flooding, tornadoes, and infrastructure failure. Disasters are not going away. More severe weather is inevitable. Pandemic viruses continue to emerge. The country faces potential cyber attacks, nuclear plant meltdowns, improvised nuclear devices, chemical spills, earthquakes, and the list goes on.

Are we learning from these tragedies and close calls? For example, it is clear that children must be protected in schools. Alabama now requires newly built public schools to have adequate protection from tornadoes, but Redlener said he was not aware of any similar action in the Oklahoma State Legislature thus far. There is limited understanding about how to protect backup generators in hospitals. There is also a lack of preemptive evacuation protocols. Shelters, even those designated for families, are often ill prepared for children, lacking diapers, cribs, and baby food.

Recovery

Once the initial disaster event is over, it can take a very long time for a community to return to a normal level of functionality. When a community is at high risk for further disaster events, Redlener said, the goal is not to achieve the pre-event normal, but rather to achieve a new normal with better infrastructure and stability. Redlener referred to the recovery of infrastructure as “façade recovery.” The buildings are rebuilt, the infrastructure is repaired, and there is the appearance of recovery. The recovery of the impacted population, however, takes much longer. He noted that surveys done 3, 5, and 7 years after Hurricane Katrina still indicated ongoing effects of the trauma.

Redlener also described the concept of “resilience erosion” (see Figure 2-1). People, including children, can initially persevere through a traumatic event. Children are buffered from stress by resilient adults who protect them through the period of trauma and recovery, and transmit a sense of resilience. However, the longer recovery takes, and the more stressful the recovery process is, the more difficult it is for the adult to remain a resilient buffer for the children. After weeks, months, and even years of waiting for the situation to improve, parents who were once strong begin to lose their ability to provide an emotional and functional safety net for their children. Adding to the stress is the lack of any central function that coordinates the various recovery assets available from federal, state, and local agencies, nonprofit organizations, the Red Cross, insurance companies, banks, and others. Instead, individuals who have been affected by the disaster must navigate the highly complex bureaucratic process on their own.

Setting and Achieving Goals

The basic goal with respect to disasters is to make children, families, and communities less vulnerable, and more resilient and safe. Toward this end, the 2010 NCCD report recommends specific actions to be taken to improve preparedness, response, and recovery for children (NCCD, 2010; discussed further by Schonfeld and Dodgen in the next section). In setting and achieving goals, there is what Redlener called a “denominator problem.” If achievement is thought of as a fraction, what has been completed is the numerator and what is still needed is the denominator.

Government agencies are often interested in the numerator, and issue long lists of the progress that has been made. But the denominator of "continuing needs" is huge, he said, and because of this, children are still at risk. Through focusing more on the denominator—what is still left to be done—more needs can be identified.

There are definitely wins, Redlener stressed. There is leadership buy-in to the concept that children need to be protected, there is embedded pediatric expertise throughout government, and there are many advocates. But federalism and politics run counter to national disaster planning. Washington's priorities are not necessarily the end user's priorities, and it is the local governments who determine how and when they will spend money and what their priorities are. Further, the research base on children and disasters is insufficient, and preparedness and response funding continues to be cut. Redlener pointed out that in comparison to fiscal year (FY) 2010, the President's submitted budget for FY 2014 shows funding for the Hospital Preparedness Program (HPP) cut by 35 percent, state and local preparedness programs cut by 62 percent, and the elimination of the Academic and Public Health Preparedness Centers that had been promised a 5-year lifespan.

There are many community-based programs addressing preparedness. But Redlener suggested that the scale is too large to be handled solely on a local basis. High-functioning community-based models of children's preparedness are necessary, but are not replacements for government initiatives and large-scale funding.

In conclusion, Redlener said that with regard to children we should be hoping for the best and preparing for the worst, but given the economy, the political deadlock, and children's status among national priorities, we are instead hoping that we keep dodging the bullets.

12.4 COMMUNITY CARE VS INSTITUTIONAL CARE AFTER THE DISASTER FOR THE VULNERABLE/DESTITUTE CHILDREN

Children and adolescents are largely dependent on their families to supply basic needs such as shelter, food, and economic support, as well as to fulfill many of their social and emotional needs. Youths under age fifteen represent one-third of the population in most English speaking Caribbean countries (7). Their roles and activities are dynamic, changing overtime as they get older, gain more independence, and acquire responsibilities; however, even older adolescents are frequently still dependent on their families for basic needs.

It is also important to consider that for most children and adolescents school is a significant component of their day-to-day lives, not just for education, but also for social interaction and as a support network. Post-disaster interventions addressing the needs on any level for children and

adolescents must include both family and educational institutions and should be delivered in developmentally appropriate ways.

In this context, while mental health services may have an important role to play, many of the initial post-disaster mental health interventions will be better provided not by specialized mental health or pediatric health services, but by appropriate community agencies and educational institutions. Ideally, these should be partnered with those specialized service providers that are already working in the area.

A child's reaction to a disaster situation is influenced by a number of factors (see a complete description in Table 7.2). Regardless of age, children may demonstrate difficulties in being away from their primary caretaker and exhibit a variety of sleep disturbances, including difficulty falling asleep, nightmares, and fear of the dark.

Acute Stress Reaction (ASR) is common and expected in the immediate post-disaster setting and young people experiencing it are best helped by activities designed to "normalize" their daily experience. This means addressing immediate daily living needs and returning to usual activities as rapidly as possible.

Post-traumatic stress disorder (PTSD) and depressive disorder may occur but are not diagnosable until four weeks and two weeks, respectively, after the initial event

Recommendations for institutionalized persons with mental disorders

- Ensure that at least one agency involved in health care accepts responsibility for ongoing care and protection of people in psychiatric institutions.
- If staff has abandoned psychiatric institutions, mobilize human resources from the community and the health system to care for people with severe mental disorders.
- Provide basic training and supervision for those mobilized to provide care.
- When the condition of the patient allows, care should be provided outside of an institution.
- Protect the lives and dignity of people living in psychiatric institutions, ensuring that patients' basic physical needs are met.
- Monitor the overall health status of patients and implement or strengthen surveillance of their human rights.

Support for Vulnerable Groups Following a Disaster

What is normally expected in children and adolescents following a disaster?

- Feelings of anxiety, fears, and worries about safety of self and others (more clingy to teacher or parent).
- Worries about re-occurrence of event.
- Increased levels of distress (whiny, irritable, more “moody”).
- Changes in behavior.
- Increased somatic complaints (e.g., headaches, stomach-aches, aches and pains).
- Changes in school performance.
- Recreating event (e.g., talking repeatedly about it,“playing”the event).
- Increased sensitivity to sounds (e.g., sirens, planes, thunder, backfire, loud noises).
- Statements and questions about death and dying.

These disorders will require mental health interventions. Preliminary research has identified two risk factors in children and youth that influence the presence of post-disaster mental health problems. They are the previous level of family psychopathology and family poverty. It is well understood that the psychological wellbeing of the parent is directly linked to the well-being of their child. This underscores the importance of providing post-disaster physical, social, economic, and psychological support for Caribbean mothers who tend to be the major providers of child care following a disaster.

The application of Critical Incident Stress Debriefing or Critical Incident Stress Management interventions is not likely to be helpful and may even lead to negative outcomes. There is no evidence that these forms of psychological debriefing are helpful for children, youth,or families .

The post-disaster mental health response for children and youth must be addressed in two stages: The first or immediate stage focuses on providing safety, shelter, and security to children and teenagers within the context of their community, school, and family. Except for unique circumstances or for enhanced needs associated with known, ongoing mental disorder, mental health specialists are not required. The second or emergent stage requires ensuring that these young people are able to access mental health care according to their need.

Providing mental health care for children and adolescents in the primary care system

It is essential to enhance the primary care system’s capacity to identify and effectively intervene with children and adolescents demonstrating prolonged and extensive disturbances in their mental well-being or signs and symptoms of mental disorder. Given the lack of services specializing

in child and adolescent mental health in the Caribbean region, much of the burden of care will necessarily fall on existing primary care facilities. Health care providers will need to be educated in the identification, diagnosis, and most appropriate types of intervention for children and youth prior to the onset of a disaster, since waiting to carry out this type of training until after the disaster would be too late.

First responders should similarly be educated in what the normal and expected emotional responses of children and youth are to traumatic events, and how to provide emotional support to children, families, and community. They should also be well versed in how to best access primary health care services (or specialty mental health services, if needed) for assessment, diagnosis, and treatment for those young people who may require additional care.

Recommended actions for children and youth in post-disaster settings

- Ensure that basic needs such as water, food, shelter, safety, and emotional support are met.
- Ensure that children are reunited with their parents or usual caretakers as soon as possible.
- Return to routine daily life as soon as possible (including school).
- Support mothers and other caregivers to care for their children. Children supported by caring adults who allow them to talk about their experiences and help them to cope with everyday problems and fears are less likely to develop negative outcomes.
- Mothers and other caregivers need to be taught about the expected response of their children to trauma and coached in the type of interventions that may be necessary. For example, corporal punishment for "misbehavior" should be replaced with interventions that promote self-soothing and stress reduction (such as holding and stroking the child, providing their favorite toy, etc.)
- Provide space and opportunity for play.
- Ensure that schools are prepared and functional as soon as possible.
- Develop short- and long-term mechanisms for emergency departments to deal with the unique needs of children and youth with mental health and substance use disorders and their families.
- Promote and adopt family and community engagement strategies in emergency departments including the use of trained family members to assist in service planning and delivery.
- Adopt proven and effective evidence-based strategies for emergency care for children, youth, and their families with mental health and substance use disorders.

- Provide consultation to professionals in schools, health care settings, spiritual settings, and other service systems who see trauma-exposed children and families.

- Obtain training in developmentally and culturally appropriate evidence-based therapies for child trauma to effectively treat children who do not recover on their own.

Support for Vulnerable Groups Following a Disaster

Maintaining specialty services for children with pre-existing mental disorders It is important to be able to identify children at risk for most negative mental health outcomes, including young people with pre-existing mental health problems and mental disorders. Thus, existing mental health services that can assess, diagnose and provide the best evidence-based care for children and adolescents must be maintained. Additionally, primary health care roviders, teachers, parents, and other community workers must be educated to recognize children and youth who show signs of significant mental health problems or mental disorders. Establishing and maintaining the linkage between specialty and primary care services, with clear referral procedures, must be a priority in the post-disaster period.

Psychosocial Care Programme vulnerable Groups

· It is important to recognize psychosocial need as an essential aspect for overall relief, rehabilitation and reconstruction efforts. Psychosocial care is an integral part of the overall care.

· The effort is to move the agenda from deviancy to normalcy and give no labels to the people to stigma to the affected people. There is an effort not to talk of 'mental cases' and 'people going mad' which give a derogatory connotation to essentially normal reactions to an abnormal experience.

· Relief, rehabilitation and reconstruction need to take place as rapidly as possible, and with the greatest degree of transparency and community involvement.

· Indicators such as psychological distress, functionality, impact of events, life events, quality of life and community life needs to be measured and taken into consideration for appropriate intervention.

· Provide psychosocial care as part of the total care programme. Net-working, coordination and referral for various support services among the servicing agencies is crucial part of rehabilitation

· Provide information to the people about the normalcy of the experience of symptoms, the choices they can make about sharing, choosing positive lifestyles and utilizing community support and people's faith in religion to help them in recovery.

- All community level workers engaged in relief, rehabilitation and reconstruction to receive skills for essentials of psychosocial care (ventilation, empathy, active listening, social support, externalization of interests, recreation/relation and spirituality) as part of the overall rebuilding process. Simple manuals have been developed towards these two groups, namely the people and the community level workers.
- The needs of children to be addressed through training the schoolteachers in psychosocial care, using story telling, games, drawing and group activities.
- All the medical personnel caring for the people to receive training in the essentials of mental health care so that they recognize these conditions and treat them with specific interventions and thus avoid dependence on non-specific interventions like the use of pain relievers, sleeping tablets, vitamins and injections. Ensuring referral for higher order mental health needs to specialised mental health professionals is also important.
- Support by mental health professionals for preparation of educational materials for training the community level workers and give specialized care to those needing more intensive care
- The administrators to recognize the need and integrate psychosocial care as part of the overall care programmes.
- Care of the care providers is most crucial in disaster intervention work. The module on stress management among the rehabilitation workers is directed towards "harmonising personal, professional and familial life" to ensure better coping, positive life style and well-being.
- There is an urgent need to educate and train people in disaster preparedness and psycho social issues at the individual, family and community level in case of future disasters. This enables a community oriented effort rather than dependency on outside agents.

12.5 FOSTER CARING OF THE DESTITUTE CHILDREN AFTER THE DISASTER

"Children need more than good physical care. They also need the love, attention and an attachment figure from whom they develop a secure base on which all other relationships are built." – John Williamson and Aaron Greenberg

Foster Care is a non-institutional child care alternative whereby the child lives with an extended or unrelated family for temporary care. This caters to children whose biological parents are unable to care for them for variegated reasons or who is separated from his/her family. It aids and promotes the environment, which is conducive to the personal growth and development of the child. Unlike adoption, it is temporary and does not terminate the biological parent's right to care for or control the assets of their children. Similarly, guardianship as opposed to foster is permanent

although it does not terminate the legal ties with biological parents. The concept of child's right to family care is rooted in international conventions like Convention on the Rights of the Child, 1989("CRC"), the UN Guidelines for Alternative Care 2009, the Indian Constitution, legislative enactments and the jurisprudence of the Indian Supreme Court on child rights. The manifest shift in the child care jurisprudence towards de-institutionalization of child care calls for a robust legal framework pertaining to foster care in India.

In India, the history of foster care can be traced back to 1960, when the same was first initiated by the Central Government. The first non-institutional scheme was introduced in Maharashtra in 1972.[1]The scheme was later revised in 2005 as the 'Bal Sangopal Scheme – Non-Institutional Services'.[2]In the late 1990's Karnataka implemented a foster care scheme committed to destitute children. Moreover, the emergency schemes were operational in Gujarat, after the 2001 earthquake where around 350 children were rehabilitated with their relatives and neighbours in the community.[3]TheJuvenile Justice (Care and Protection of Children) Act, 2015 and Integrated Child Protection Scheme, 2009 (ICPS) presently incorporate the provisions for foster care. (Legvice Service India).

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. Expand a) EOP b) ICS

ii. What involves taking steps to reduce the risk and effects of a potential disaster?

iii. What is the basic goal with respect to disasters

iv. What is essential about primary care system?

v. Recommended for children and youth in post-disaster settings:

vi. Why Psychosocial Care Programme for vulnerable Groups is important?

12.6 LET US SUM UP

Many children under the age of five spend their daytime hours away from their parents. Most of these children are in a child care center/child care home. Emergencies occurring during hours of operation require pre planning. A child care center/child care home director's primary responsibility is assuring the safety of children in their care. Children and adolescents are largely dependent on their families to supply basic needs such as shelter, food, and economic support, as well as to fulfill many of their social and emotional needs. So the special needs of the children & adolescents and the vulnerable groups are discussed in this chapter.

12. 7 UNIT END EXERCISE

1. Elicit the salient features of the Role of Child Care personnel for the Children affected by disaster.
2. Elucidate the need of Empowering care givers after the disasters.
3. Pen down the methods of working with children affected by disaster.
4. Explain the need and importance of community care and institutional care.
5. Suggest few ways for Foster Caring of the destitute children after the disaster.
6. Discuss on few recommended actions for children and youth in post-disaster settings.

12.8 ANSWER TO CHECK YOUR PROGRESS

i. a) EOP- Emergency Operations Plan. b) ICS- Incident Command System (ICS).

ii. Prevention involves taking steps to reduce the risk and effects of a potential disaster.

iii. The basic goal with respect to disasters is to make children, families, and communities less vulnerable, and more resilient and safe.

iv. It is essential to enhance the primary care system's capacity to identify and effectively intervene with children and adolescents. demonstrating prolonged and extensive disturbances in their mental well-being or signs and symptoms of mental disorder.

v. Recommended for children and youth in post-disaster settings: Ensure that basic needs such as water, food, shelter, safety, and emotional support are met. Ensure that children are reunited with their parents or usual caretakers as soon as possible.

vi. Psychosocial Care Programme vulnerable Groups are important to recognize psychosocial need as an essential aspect for overall relief, rehabilitation and reconstruction efforts. Psychosocial care is an integral part of the overall care.

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UNIT XIII - PSYCHOLOGICAL IMPACT OF DISASTERS

Structure

13.1 PSYCHOLOGICAL IMPCT OF DISASTERS IN DIFFERENT PHASE BEHAVOURIAL DISORDERS SUBSEQUENT TO DISASTERS INCLUDING PTSD

Studies predicted the following high-risk variables: Severity of the disaster, threat to life, loss of life, loss of family members and duration of exposure. Recent additions are: Female gender, children, elderly, physically disabled, single, ethnic minority, displaced population, poverty, substance use like smoking, loss of economic livelihood, poor social support and family support.

Most children and young people are resilient, but also very vulnerable to the psychosocial effects of disasters. People with pre-existing mental disorders are well known to relapse during disasters. Similarly, people with poor coping capacity, substance use and chronic general medical conditions are also at the high risk. Hence, general physician practicing in the area of disaster zone should be aware of high prevalence of mental health disorders in chronic medically-ill patients. Similarly, disaster rescue workers are at high risk of developing psychiatric morbidity.

During and after events that are very stressful, the mind can go through some serious changes as well. By psychological we mean the ways that events affect people's way of thinking about themselves and the world around them, as well as the emotions or feelings they may have in the aftermath of an event.

- **Thinking:** Often, individuals will have a harder time concentrating after a disaster or traumatic event. They may need to be reminded of things several times before they seem to understand or remember it; that's normal. The same chemicals that affect their bodies can affect their ability to concentrate or make thoughtful decisions. This difficulty with

concentrating and memory usually goes away over time for most people.

- **Feeling:** Of course, how you think affects how you feel. For example, after a major event people might think they are not safe (even if they are) and so they will feel afraid. They may think they are to blame for some aspect of the disaster (for example that one of their loved ones has been killed or injured) and so they may feel guilty. Religious beliefs might also contribute to a sense of guilt or self-blame (e.g. a lack of religious practice or faith has brought the disaster upon them). Victims may think they have no control over anything and therefore feel helpless. Thinking and feeling are interconnected.

The psychological effects of disaster impact an individual's way of thinking and feeling. A lengthier list of common thoughts and emotions after a disaster will be covered later in the guide.

Common disorders are: Adjustment disorders, depression, post-traumatic stress disorder (PTSD), anxiety disorders, non-specific somatic symptoms and substance abuse. Researchers have assigned that the PTSD as the signature diagnosis among post disaster mental morbidity. Prevalence of PTSD reported in literature varies from 4-60%.

Mood disorders, PTSD and substances use disorders are diagnosed frequently along with other psychiatric disorders. Depression is a well-known co-morbidity and can pose a challenge to any treating team. Mental health morbidity continues to be prevalent even after 3-5 years in the disaster affected community.

13.2 METHODS OF PROVIDING PSYCHOSOCIAL CARE TO THE DISASTER SURVIVORS

Psychosocial care activities for the survivors of disaster include integration of the same during the rescue, relief, rehabilitation and reconstruction phases as an essential part of the overall interventions. The form of care varies with each phase and the local situation. During the time of disaster, the people are forced towards basic survival and are left to fend for themselves. In the rescue phase, volunteers and others at the disaster scene can provide essential emotional first aid and form the base for further intensive psychosocial care and rehabilitation by trained community workers and the professionals in the relief and rehabilitation phases. The rebuilding phase is a long-term process and involves integrating a comprehensive disaster mental health programme for the affected communities. Disaster preparedness and education is a continuous on-going activity coupled with overall community development.

It is important to recognize psychosocial need as an essential aspect for overall relief, rehabilitation and reconstruction efforts. Psychosocial care is an integral part of the overall care.

- The effort is to move the agenda from deviancy to normalcy and give no labels to the people to stigma to the affected people. There is an effort not to talk of 'mental cases' and 'people going mad' which give a derogatory connotation to essentially normal reactions to an abnormal experience.

- Relief, rehabilitation and reconstruction need to take place as rapidly as possible, and with the greatest degree of transparency and community involvement.

- Indicators such as psychological distress, functionality, impact of events, life events, quality of life and community life needs to be measured and taken into consideration for appropriate intervention.

- Provide psychosocial care as part of the total care programme. Net-working, coordination and referral for various support services among the servicing agencies is crucial part of rehabilitation.

- Provide information to the people about the normalcy of the experience of symptoms, the choices they can make about sharing, choosing positive lifestyles and utilizing community support and people's faith in religion to help them in recovery.

- All community level workers engaged in relief, rehabilitation and reconstruction to receive skills for essentials of psychosocial care (ventilation, empathy, active listening, social support, externalization of interests, recreation/relation and spirituality) as part of the overall rebuilding process. Simple manuals have been developed towards these two groups, namely the people and the community level workers.

- The needs of children to be addressed through training the schoolteachers in psychosocial care, using storytelling, games, drawing and group activities.

- All the medical personnel caring for the people to receive training in the essentials of mental health care so that they recognize these conditions and treat them with specific interventions and thus avoid dependence on non-specific interventions like the use of pain relievers, sleeping tablets, vitamins and injections. Ensuring referral for higher order mental health needs to specialized mental health professionals is also important.

- Support by mental health professionals for preparation of educational materials for training the community level workers and give specialized care to those needing more intensive care.

- The administrators to recognize the need and integrate psychosocial care as part of the overall care programmes.

- Care of the care providers is most crucial in disaster intervention work. The module on stress management among the rehabilitation workers is directed towards "harmonizing personal, professional and familial life" to ensure better coping, positive life style and well-being.
- There is an urgent need to educate and train people in disaster preparedness and psycho social issues at the individual, family and community level in case of future disasters. This enables a community-oriented effort rather than dependency on outside agents.

13.3 PRINCIPLES OF PSYCHOSOCIAL CARE

Ensure the physical safety of the victim(s) / survivor(s)

Consider the safety of the survivor: Always be aware of the security risks a survivor might be exposed to after sexual violence. Hold all conversations, assessments and interviews in a safe setting. Try, as much as the context and your position allow you, to assess the safety of the survivor (Does the survivor has a safe place to go to? Will the survivor be confronted with the perpetrator? …). Inform yourself about all options for referral available to the survivor. If possible, take action to ensure the safety of the survivor

Guarantee confidentiality

Ensure Confidentiality: Do not share the story of the survivor with others. This can be especially important in cases of biased-motivated crimes. If you need to share information with professionals, for instance to organize a referral, you can only do so if the survivor understands what this implies and has given his/her informed consent beforehand.

Respect the wishes, the rights, and the dignity of the victim(s)/ survivor(s) and consider the best interests of the child, when making any decision on the most appropriate course of action to prevent or respond to an incident of gender-based violence.

Respect the wishes, needs and capacities of the survivor: Every action you take should be guided by the wishes, needs and capacities of the survivor. Ensure attention for all needs of the survivor: medical and psychosocial needs as well as material needs and the need for justice. Respect the strength and capacities of the survivor to cope with what happened to her/him. After the survivor is informed about all options for support and referral, s/he has the right to make the choices s/he wants.

For children, the best interests of the child should be a primary consideration and children should be able to participate in decisions relating to their lives. However, adults must consider the child's age and

capacities when determining the weight that should be given to their wishes.

Treat the survivor with dignity: Show that you believe the survivor, that you don't question the story or blame the survivor and that you respect her/his privacy.

Assure a supportive attitude: Provide emotional support to the survivor. Show sensitivity, understanding and willingness to listen to the concerns and story of the survivor. Retain a caring attitude, regardless of the type of intervention you make.

Provide information and manage expectations

- Provide the survivor with information about available services and their quality to enable them to make a choice about the care and support s/he wants. Check whether the survivor fully understands all the information, and, if necessary, adapt the presentation of the information to the capacity of the survivor at that time.

- Be aware of the fact that when a survivor discloses her/his story to you, s/he trusts you and might have high expectations about what you can do to help. Always be clear about your role and about the type of support and assistance you can offer to a survivor. Never make promises that you can't keep. Always refer the survivor to the appropriate services. Respect also the limitations of what you can do (see as well Module 8).

- Provide information on safety planning.

Ensure referral and accompaniment

- Make sure you are well-informed about the options for referral (medical, psychosocial, economic, judicial) and available services, along with their quality and safety. Inform the survivor about these options. Ensure that the survivor has access to the appropriate services s/he would like to consult.

  Consider the possibility of accompaniment of the survivor throughout the process – that is, having a supportive, trusted person who is informed about the process accompany the survivor to different services

Ensure non-discrimination

Treat every survivor in a dignified way, independent of her/his sex, background, race, ethnicity, sexual orientation, gender identity, ability status, religion, or the circumstances of the incident(s).

Treat all survivors equally. Do not make assumptions about the history or background of the survivor. Be aware of your own prejudices and opinions about sexual violence and do not let them influence the way you treat a survivor.

13.4 TECHNIQUES OF PROVIDING PSYCHOSOCIALCARE

Techniques available in disaster are defined as active interactions whose aims are to promote, complement and reinforce healthy functions and adaptive behavior of the survivor. Although expressions of empathy are helpful, care must be exercised not to reinforce or reward the “victim” role. Care should be taken not to interfere with psychological defenses, which the survivor needs during the initial period post-disaster. Establishing a relationship may be difficult in the initial period because the survivor often has distorted thinking due to high anxiety and cognitive blurring. They may be defensive, guarded and overwhelmed. Once established the relationship the worker can offer options in solving problems and can help the survivor by suggesting options in solving problems to find the most feasible way of living day by day.

The worker needs to be aware that the survivor is going to face different experiences as the community is reorganizing and as individuals continue to return to function. Each of these phases will stimulate varying emotions and attitudes presenting a challenge to the worker who needs to ascertain what this changed behavior means. What this increasing knowledge of behavior change in relation to time lapse indicates is that, intervention has to be "in sync" with the stage of crisis resolution after the disaster impact.

Post-Disaster Crisis Counseling

Post-Disaster crisis counseling is defined as "a mental health intervention technique useful in post-disaster events that seeks to restore the capacity of the individuals to cope with the stressful situation in which they find themselves. It has three aims: a) restoring capacity of the individual; b) reordering and organizing their new world; and c) assisting the victim to deal with the bureaucratic relief emergency program." The methodology to bring about these objectives varies according to the school of thought used by the worker. The reality circumstances mandate a short, flexible, creative adaptable approach compared to our usual organized, systematic clinical approach. This is an area where we continue to adapt clinical skills and modify our approaches as we learn from one disaster to the next. Differentiating variables like age, sex and cultural backgrounds taught us that both reactions and successful interventions differed in children, adults and the elderly of different cultures.

The goal of post-disaster psychological intervention is to alleviate a survivor’s emotional distress and/or cognitive disorganization and to suggest corrective action and offer appropriate information. The worker can help survivors identify, interpret and normalize their overwhelming emotions, understand the normal reactive nature of feelings, and recover a sense of capability and hopefulness.

13.5 NORMALIZATION MODEL

"The normalization principle means making available to all people with learning difficulties patterns of life and conditions of everyday living which are as close as possible to the regular circumstances and ways of life or society." (Bengt Nirje, The basis and logic of the normalisation principle, Sixth International Congress of IASSMD, Toronto, 1982.)

Normalization involves the acceptance of people with disabilities, with their disabilities, offering them the same conditions as are offered to other citizens. It involves an awareness of the normal rhythm of life – including the normal rhythm of a day, a week, a year, and the life-cycle itself. It involves the normal conditions of life – housing, schooling, employment, exercise, recreation and freedom of choice. This includes "the dignity of risk", rather than an emphasis on "protection"

Check your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. List out some Common disorders.
ii. What is the major role in rebuilding phase?
iii. Define Post-Disaster crisis counseling.
iv. What is essential about primary care system?
v. what is normalization principle?

13.6 LET US SUM UP

Most children and young people are resilient, but also very vulnerable to the psychosocial effects of disasters. People with pre-existing mental disorders are well known to relapse during disasters. Similarly, people with poor coping capacity, substance use and chronic general medical conditions are also at the high risk at the time of disaster. Psychological Impact of Disasters In Different Phase Behavourial Disorders Subsequent To Disasters Including PTSD, Methods of Providing Psychosocial Care to the Disaster Survivors Principles of Psychosocial Care, Techniques of Providing Psychosocial Care, Normalization Model and Needs of the Special Groups in Disaster and Psychosocial Care is discussed in this chapter.

13. 7 UNIT END EXERCISE

1. Explain the Psychological Impact of Disasters In Different Phase
2. Explain the Principles of psychosocial care.

3. Elucidate the Methods of Providing Psychosocial Care to the Disaster Survivors
4. Write a note on the Techniques of Providing Psychosocial Care
5. How does the Normalization Model works at the time of disaster?
6. Give an explanation on Needs of the Special Groups in Disaster and Psychosocial Care

13.8 ANSWER TO CHECK YOUR PROGRESS

i. Common disorders are: Adjustment disorders, depression, post-traumatic stress disorder (PTSD), anxiety disorders, non-specific somatic symptoms and substance abuse.

ii. The rebuilding phase is a long-term process and involves integrating a comprehensive disaster mental health programme for the affected communities.

iii. Post-Disaster crisis counseling is defined as "a mental health intervention technique useful in post-disaster events that seeks to restore the capacity of the individuals to cope with the stressful situation in which they find themselves.

iv. “The normalization principle means making available to all people with learning difficulties patterns of life and conditions of everyday living which are as close as possible to the regular circumstances and ways of life or society.”

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UNIT XIV - CAPACITY BUILDING & POLICIES AND ROLE OF GOVERNMENT SECTORS

Structure

14.1 CAPACITY BUILDING

14.1.1 Government and NGO

NDMA: Capacity building is an ongoing process that equips officials, stakeholders and the community to perform their functions in a better manner during a crisis/disaster. In the process of capacity building, we must include elements of human resource development, i.e., individual training, organizational development such as improving the functioning of groups and organizations and institutional development. At the national level, The National Institute of Disaster Management (NIDM) is the capacity building arm and the States have disaster management cells in the State Administrative Training Institutes performs the function of capacity building for effective and efficient disaster management. There are a number of other training institutes which are engaged in training and capacity building in the area of disaster management.

Roles and Responsibilities

- To develop parameters under which NIDM has to function and correspondence relating thereto. Preparation of NIDM guidelines
- Matters relating to Capacity Building Grant under 13th Finance Commission
- International Co-operation Cell in CBT from the perspective of capacity building in international training, and other international coordination disaster management related issues.
- Processing of proposals received from different organizations and NGOs for organizing events on disaster related subjects
- Utilization and uploading of deliverables received in form of video clips/presentations/reports etc.
- To coordinate with the State Governments and UN agencies on training programmes initiated by UNDMT, UNFPA and other UN agencies
- International workshop such as EAS-ASEAN and NPDRR
- UNFPA (MISP Training) – Correspondence with State authorities and resource persons
- Nomination of officers from NDMA on subjects relating to disaster as guest lecturer.
- Parliament Questions/RTI Matters/VIP references/reports & returns
- Other miscellaneous issues such as Organization of Relief Commissioners conference – providing logistic support etc
- Revised guidelines for the National Institute of Disaster Management (NIDM)
- Training part of NDRF

Objectives: The objectives of the scheme are as under:-

(i) Development and Standardization of training modules at National Level;

(ii) Development of Information Knowledge Management System at National level linked to States and UTs;

(iii) Training institutions to be empanelled by respective project States/UTs at the state level;

(iv) To train 6000 community volunteers in life saving skills of disaster response (flood relief and rescue) and provide personal protective equipment and emergency responder kits;

(v) To create a Community Emergency Stockpile/Reserve at the district/block level containing essential light search and rescue equipments, medical first aid kits, etc;

(vi) To disseminate training and education tools developed under the project to more number of flood prone districts in subsequent phases of the scheme.

2. Project on Sustainable Reduction in Disaster Risk in 10 Multi-Hazard prone districts in 5 States of India-

Introduction: The Project was started in June, 2016 with the aim to strengthen community and local self-government's preparedness and response in 10 most multi-hazard vulnerable Districts, 2 each in 5 identified States i.e. Assam, Bihar, Himachal Pradesh, Jammu & Kashmir and Uttarakhand.

(i) Comprehensive Disaster Risk Reduction/Recovery Plan for each District;

(ii) Awareness/Publicity Campaigns throughout the selected District;

(iii) Preparation/Updation of training modules in CBDM;

(iv) Formation of Disaster Management Teams at District Levels;

(v) Training of trainers/stakeholders on CBDM;

(vi) Conduction of mock drills in selected District.

NGO

NGOs are organizations registered under various Indian laws such as the Societies Registration Act, 1860, Section 25(1) of Companies Act, 1956 meant for non-profit companies, or State-specific Public Charitable Trust Acts. NGOs work on a variety of areas like humanitarian assistance, sectorial development interventions and sustainable development. NGOs play important roles in different stages of the Disaster Management Cycle.

Volunteerism and social service has deep roots in India, since time immemorial, even though it received special significance during the freedom struggle through the Gandhian concept of Shramdaan, implying the offering of free labour for some noble cause like rural development, construction of social assets and public infrastructure and amenities, etc. In post-Independent India, the Non-Governmental Organisations (NGOs) have been providing support in critical sectors like health, education, water supply and sanitation, shelter and infrastructure, restoration of livelihoods, food security and nutrition, environment, etc. Given India's multi-hazard risk and vulnerability to natural and man-made disasters, NGOs have been playing a significant role in providing humanitarian assistance to disaster-affected people in most of the severe disasters like the Latur earthquake in 1993, Orissa super cyclone in 1999, Bhuj earthquake in 2001, Indian

Ocean tsunami in 2004, Kashmir earthquake in 2005, Barmer floods in 2006, Kosi floods in 2008,cyclones Aila and Laila and the more recent cloud burst in Leh in August 2010, apart from participating in providing relief to disaster affected communities in various other localised disasters.

In the recent past, the role of NGOs in disaster management (DM) has started changing from providing post-disaster relief to strengthening pre-disaster preparedness and mitigation through capacity building, public awareness campaigns, mock exercises, workshops and conferences, etc. NGOs have also started to collaborate with corporate entities in Public-Private Partnership (PPP) projects and Corporate Social Responsibility (CSR) initiatives in the field of DM at State, District and Sub-district levels. Till recently, the work of NGOs in the field of DM has been mostly sporadic, reactive, responsive and driven by local level compulsions in the geographic areas where they are implementing development projects and very often they faced enormous challenges in coordinating with the government machinery and even among NGOs themselves.

In line with it's mandate as envisaged in the Disaster Management Act 2005 (DM Act 2005), the National Disaster Management Authority (NDMA) has circulated National Disaster Management Guidelines on Role of NGOs in Disaster Management defining the role of NGOs in disaster management.

14.1.2 Spectrum of Care

A key component of the Health One NSW model of care is the provision of coordinated and integrated primary health care services that encompass:

- health promotion and illness prevention;
- early detection and intervention;
- continuing care for people with chronic and complex conditions;
- multidisciplinary planned care.

Health promotion and illness prevention are also known as primary prevention. The goal of primary prevention is to reduce the likelihood that a disease or disorder will develop. Primary prevention activity involves eliminating or reducing causes or determinants of ill health, controlling exposure to risk, and promoting factors that are protective of health.

Early detection and intervention is also known as secondary prevention. Secondary prevention interrupts, prevents or minimises the progression of a disease or disorder at an early stage. Secondary prevention strategies include screening at-risk populations at an asymptomatic stage and early intervention.

Continuing care for people with chronic conditions, or chronic disease management, has been described as an intervention designed to manage a

chronic condition using a systematic approach to care and potentially employing multiple treatment modalities.

The prevention aspect of chronic disease management, also known as tertiary prevention, aims to minimise the impact of established disease and improve function through effective treatment and rehabilitation. Elements of chronic disease management that have been found to most frequently impact on health, function and quality of life are self management support (in particular development of self efficacy) and multidisciplinary team care with practice nurses and allied health care.

The range of services provided by each HealthOne NSW service varies from site to site and is planned and delivered in response to the needs of each community. The range of services reflects the spectrum described above, and can include immunisation, the provision of healthy lifestyle clinics and information sessions (e.g. smoking cessation, cardiac fitness), child and maternal health care, diabetes education, continence assessment, mental health care, cardiac rehabilitation, palliative care, drug and alcohol services and a number of dedicated Aboriginal health services.

Several HealthOne NSW services also provide or co-ordinate access to other government and non-government health and human services to assist clients from culturally and linguistically diverse backgrounds, people from Aboriginal communities and others who require assistance to access health services and information. The range of HealthOne service partners can include the Department of Family and Community Services, the NSW Refugee Health Service, NSW Juvenile Justice, Aboriginal Health Services, Transcultural Mental Health Services, interpreter services and others. (NSW)

14.1.3 Inter Sectoral and Coordinated Care Provision between Organizations

The structures and processes that are used to formalize intersectoral and intergovernmental collaboration will vary between countries and will be influenced by existing institutions, traditions and constitutional arrangements, as well as the specific priorities that are being pursued. Policies tend to evolve incrementally, rather than through a dramatic process of re-invention. For this reason, there may be benefits to building on existing structures and processes, while shaping and adapting them in new directions.2 There is no single blueprint for intersectoral action in health. Governments may choose to invest in a number of structures and processes that vary in scale and focus in order to address different goals and priorities. Some intersectoral initiatives may be framed largely in terms of the health benefits they aim to achieve, such as obesity prevention or active living. More ambitious, cross-sectoral partnerships may aim to achieve a number of economic and social objectives, including

improvements in health and well-being. Examples of broader, intersectoral partnerships include:

• initiatives to reduce road traffic injuries;

• initiatives to improve the safety and security of the food supply;

• initiatives to improve child health, well-being and educational attainment; and integrated approaches to improving the quality of the local environment encompassing, for example, improved housing, infrastructure, social services, crime prevention and environmental remediation.

Intersectoral structures may also provide a solution when governments have already passed multiple pieces of legislation that overlap and share common goals, but which are administered across a number of ministries. For example, the Republic of Korea has passed 25 Acts, administered by six ministries, which seek to improve the physical health and nutrition of children, and to reduce obesity. While the overlapping tasks mandated under these Acts could be merged within a single ministry, another alternative is to create an intersectoral committee to facilitate collaboration among ministries

Intersectoral initiatives may generate benefits that extend well beyond health. Public health leaders should consider how best to present the case for intersectoral action, remembering that collaboration with other sectors and ministries may be easier to achieve when initiatives are framed in terms of language, concepts, goals and values that are familiar or appropriate to that sector. For example, an integrated approach to reducing rates of violence in disadvantaged urban communities is relevant to the goals and values of policing and the justice sector. In addition, however, intersectoral action on the underlying social determinants of violence could include policies and programmes to respond to drug and alcohol problems, mental illness, poverty and unemployment. Laws, policies and programmes to create safer and healthier communities, in turn, will contribute to broader, societal goals; for example, reducing reliance on government welfare payments, creating a more socially cohesive environment that attracts local businesses, attracts tourism and reduces the pressure on over-burdened health systems and health care workers

Public health leaders can help to overcome inertia and to generate political support for intersectoral action by highlighting the health benefits that could result from coordinated action. For example, the threats to health and health equity are not the only grounds for action on climate change. Nevertheless, mitigating the impacts of climate change on health is an important argument supporting an all-of-government approach to improving environmental sustainability and reducing greenhouse gas emissions.

Intersectoral action in health

The evolution of an idea this subsection briefly reviews highlights in the evolution of intersectoral action in health, and identifies some priority areas where intersectoral governance structures could be used to advance the right to health.

In the Alma Ata Declaration (1978),7 intersectoral action was recognized as a key to improving primary health care, through coordinated action across a range of sectors, including agriculture, animal husbandry, food, industry, education, public works and communications. In 1986, the Ottawa Charter for Health Promotion recognized that intersectoral action is fundamental to reducing inequalities in health status within the population.The Charter emphasized health promotion both as a concept and strategy for re-orienting health systems in order to improve health equity and to achieve greater control by individuals and communities over the determinants affecting their health.

14.1.4 Disaster Preparedness

Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences.

Disaster preparedness provides a platform to design effective, realistic and coordinated planning, reduces duplication of efforts and increase the overall effectiveness of National Societies, household and community members disaster preparedness and response efforts. Disaster preparedness activities embedded with risk reduction measures can prevent disaster situations and also result in saving maximum lives and livelihoods during any disaster situation, enabling the affected population to get back to normalcy within a short time period.

Disaster preparedness is a continuous and integrated process resulting from a wide range of risk reduction activities and resources rather than from a distinct sectoral activity by itself. It requires the contributions of many different areas—ranging from training and logistics, to health care, recovery, livelihood to institutional development.

14.1.5 Disaster Sub Culture

A disaster subculture develops when an area has been repeatedly hit by natural disasters and as a result, develops a "culture" of appropriate response. Essentially, though the area is in a state of "disaster" it applies lessons learned from previous and similar situations to respond quickly, appropriately, and with as much efficiency as possible.

A disaster subculture is also apparent when in addition to efficiency of emergency response there is an overall indication of a general community adaptation to such situations. This adaptation could be apparent in the

general attitude of the community shown, for example, in a tendency to always be mentally and physically prepared, as well as responding in the aftermath of a disaster with a sense of emotional well-being. If a disaster subculture truly exists within a community, the present community members will pass it on to new community members, even during disaster-free periods.

Communities throughout the world are subject to the disruptive impacts of a variety of disaster agents. From a sociological perspective, the impact of a flood, hurricane, tornado, earthquake, or some other agent may be considered as disaster when the agent presents demands and threats to a community which cannot be met by the institutionalized means that are utilized for its normal emergencies. When disaster strikes, a community must replace its routine social system with alterative activities and forms of organization that are more appropriate to the disaster context. Typically, much of the activity and organization which are utilized by the community in responding to the disaster emerge during the actual stress of the disaster situation. Often, however, the shape of disaster response depends in part upon a community's past experience with similar events. That is, previous community disaster activity provides some residue of learning which is applied to subsequent situations. When these residues are preserved, we can speak of community possessing a "disaster subculture." Preservation, therefore, is the essence of a disaster subculture. One the one hand, the residues of learning are applied to aid in the community's survival. On the other hand, the subculture itself is preserved through time by the transmission of its elements to new community members. The true indication of the existence of a disaster subculture, therefore, is the perpetuation of successful patterns of adaptation to the disaster context through socialization. These subcultures appear to develop in many communities that experience repetitive impact from specific disaster agents. (Wenger, Dennis E.; Weller, Jack M.)

The term "disaster subculture", was introduced in the 1960s and 1970s, but has since not been given a great deal of attention. Even though it is still referred to in passing, the elements of disaster subculture are rarely discussed. After considering some examples of the phenomenon and its characteristics, concludes that disaster or emergency subculture does not seem to be an appropriate application of the wider sociological concept of subculture. It is not an alternative to the mainstream culture of a society but represents an aspect of that dominant culture that only manifests itself under particular circumstances. Proposes that, like other aspects of culture, it is learned by society and its members from past experience, personal as well as societal. It entails many features typical of society's cultural heritage and often entails role and behaviour changes deemed appropriate in emergencies. Concludes that, in light of this discussion, it would seem reasonable to change the term subculture as applied to disaster behaviour to bring the name in line with generally accepted usage. (Granot, H., 1996)

Looking back over time reveals many examples of what might be deemed "cultures of disaster:" that is, cultural adaptations whereby people modified their behaviour and the environment around them to accommodate hazards on a frequent basis. Just how far any culture is modified depends on the frequency with which the hazard recurs, whether communities are forewarned of the event, the severity of the impact experienced, and its geographical diffusion. Gradations in the extent to which societies seek to normalise risk range from disaster subcultures, with their single hazard and localised adjustments, to disaster cultures that involve much wider societal adjustments to one or many frequently-recurring hazards, to risk-mitigating strategies where one or more specific aspects of culture are similarly influenced. (Living with Hazard: Disaster Subcultures, Disaster Cultures and Risk-Mitigating Strategies, 2017)

14.1.6 Disaster Resilience Role of Social Workers in Disaster Services

Floods, wildfires, earthquakes, and hurricanes have the potential to devastate our way of life, and the cumulative effect of these disasters produces a significant personal, material and economic strain on individuals, communities, and the fiscal capacity of all levels of governments.

The social work profession has long been involved with disaster relief, both through the profession's roots in the provision of wartime relief, and its concern with the physical environment of people. Beginning with the Civil War and continuing with the formal role of social workers in Vet Centers, social workers have helped treat the trauma resulting from wartime deployment (Pryce & Pryce, 2000). In the social work perspective, the environment is included among the physical, biological and social factors influencing the welfare of individuals, groups, and populations. Since the late nineteenth century social workers have intervened in the microenvironments of people to improve their health status, residential living environment, workplace conditions, and social and psychological functioning (Zakour, 1996a). An important focus for these interventions has been the urban environment of immigrants to the United States before 1900. Crowded and unhealthy tenement living, poor public health, and elevated morbidity and mortality in these urban settings led to collaborative efforts by social workers and public health workers to seek to reform urban systems and conditions.

These early urban reform efforts were closely related to the Settlement House movement led by Jane Addams at Hull House, and to the Charity Organization Societies. The settlement house workers lobbied for public health reforms which resulted in a sharp decrease in morbidity and mortality from epidemic disease in urban areas (Zakour, 1996a). Settlement workers in Chicago provided disaster relief and services to

victims of the Chicago Fire in 1871. Charity Organization Societies (COS) responded to the San Francisco Earthquake of 1906, using their tradition of interagency coordination to improve disaster response. Both the COS and the settlement house workers represent early movements within social work emphasizing both community mobilization and services coordination. Community mobilization to improve environmental conditions for individuals, households, and populations provided the roots for environmental concerns in social work today. More effective coordination continues to be a focal point for improvements in disaster response within social work. Coordination promises to make services accessible for vulnerable populations, as well as link services together to provide for improved continuity of care for victims of disaster (Zakour & Harrell, 2003).

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14.2 POLICIES AND ROLE OF GOVERNMENT SECTORS

14.2.1 Role of State, Central, UN Agencies, International Organisations and NGOS in Disaster Management

While the primary responsibility of disaster management rests with the States, the Central Government supports the efforts of State Governments by providing logistical and financial support.

On behalf of the Central Government, DM Division in the Ministry of Home Affairs co-ordinates with disaster affected State Government(s), concerned line ministries/departments, National Disaster Management Authority (NDMA), National Disaster Response Force (NDRF), National Institute of Disaster Management (NIDM) and the Directorate General of Fire Services, Home Guards and Civil Defence, and Armed Forces for effective disaster risk reduction. The Division is responsible for legislation, policy, capacity building, prevention, mitigation, response and long term rehabilitation. Major responsibilities of the Disaster Management Division, MHA are as follows:

- Resource mobilization for relief and response to natural disasters except drought, hail storms, cold and frost waves and pest attack
- Operation of control room and situation reports
- Multi-hazard Early Warning Systems
- Matters related to State Disaster Response Fund and National Disaster Response Fund
- All matters related to disaster response, preparedness, prevention, mitigation and capacity building
- International cooperation in disaster management
- Post-disaster/long term rehabilitation and reconstruction
- All administrative and budget matters related to NDMA, NDRF and NIDM
- Strengthening of fire and emergency services
- All matters related to Fire Services, Civil Defence and Home Guards including Director General of (Fire Services, Civil Defence & Home Guards), National Civil Defence College (NCDC) and National Fire Service College (NFSC)
- Administration of the Disaster Management Act, 2005
- Provides secretarial support to NEC, HLC and NPDRR.

1.	Disaster Management Act	2005
2.	National Disaster Management Policy	2009
3.	National Disaster Management Plan	2016
4.	Civil Defence Amendment Act	2009
5.	Civil Defence Act	1968
6.	Revised Model Fire Service Bill Model Fire Service Bill	2019 1958

(1) As per the section 10(1) of Disaster Management Act, 20015, the National Executive Committee shall assist the National Authority in the discharge of its functions and have the responsibility for implementing the policies and plans of the National Authority and ensure the compliance of directions issued by the Central government for the purpose of disaster management in the country.

(2) Without prejudice to the generality of the provisions contained in sub-section (1), the National Executive Committee may--

A. Act as the coordinating and monitoring body for disaster management;
B. Prepare the National Plan to be approved by the National Authority;
C. Coordinate and monitor the implementation of the National Policy;
D. Lay down guidelines for preparing disaster management plans by different Ministries or Departments of the Government of India and the State Authorities;
E. Provide necessary technical assistance to the State Governments and the State Authorities for preparing their disaster management plans in accordance with the guidelines laid down by the National Authority;
F. Monitor the implementation of the National Plan and the plans prepared by the Ministries or Departments of the Government of India;
G. Monitor the implementation of the guidelines laid down by the National Authority for integrating of measures for prevention of disasters and mitigation by the Ministries or Departments in their development plans and projects;
H. Monitor, coordinate and give directions regarding the mitigation and preparedness measures to be taken by different Ministries or Departments and agencies of the Government;
I. Evaluate the preparedness at all governmental levels for responding to any threatening disaster situation or disaster and give directions, where necessary, for enhancing such preparedness;
J. Plan and coordinate specialised training programme for disaster management for different levels of officers, employees and voluntary rescue workers;
K. Coordinate response in the event of any threatening disaster situation or disaster;

L. lay down guidelines for, or give directions to, the concerned Ministries or Departments of the Government of India, the State Governments and the State Authorities regarding measures to be taken by them in response to any threatening disaster situation or disaster;
M. Require any department or agency of the Government to make available to the National Authority or State Authorities such men or material resources as are available with it for the purposes of emergency response, rescue and relief;
N. Advise, assist and coordinate the activities of the Ministries or Departments of the Government of India, State Authorities, statutory bodies, other governmental or non-governmental organisations and others engaged in disaster management;
O. Provide necessary technical assistance or give advice to the State Authorities and District Authorities for carrying out their functions under this Act;
P. Promote general education and awareness in relation to disaster management; and
Q. Perform such other functions as the National Authority may require it to perform.

(Disaster Management Division Ministry of Home Affairs)

14.2.2 India Disaster Management Plan

The Disaster Management Act, 2005 (DM Act 2005) lays down institutional and coordination mechanism for effective Disaster Management (DM) at the national, state, district and local levels. As mandated by this Act, the Government of India (GoI) created a multi-tiered institutional system consisting of the National Disaster Management Authority (NDMA) headed by the Prime Minister, the State Disaster Management Authorities (SDMAs) headed by the respective Chief Ministers and the District Disaster Management Authorities (DDMAs) headed by the District Collectors and cochaired by Chairpersons of the local bodies. These bodies have been set up to facilitate a paradigm shift from the hitherto relief-centric approach to a more proactive, holistic and integrated approach of strengthening disaster preparedness, mitigation, and emergency response.

The National Disaster Management Plan (NDMP) provides a framework and direction to the government agencies for all phases of disaster management cycle. The NDMP is a “dynamic document” in the sense that it will be periodically improved keeping up with the emerging global best practices and knowledge base in disaster management. It is in accordance with the provisions of the Disaster Management Act, 2005, the guidance given in the National Policy on Disaster Management, 2009 (NPDM), and the established national practices.

The NDMP recognizes the need to minimize, if not eliminate, any ambiguity in the responsibility framework. It, therefore, specifies who is responsible for what at different stages of managing disasters. The NDMP is envisaged as ready for activation at all times in response to an emergency in any part of the country. It is designed in such a way that it can be implemented as needed on a flexible and scalable manner in all phases of disaster management: a) mitigation (prevention and risk reduction), b) preparedness, c) response and d) recovery (immediate restoration to build-back better).

The NDMP is consistent with the approaches promoted globally by the United Nations, in particular the Sendai Framework for Disaster Risk Reduction 2015-2030. It is a non-binding agreement, which the signatory nations will attempt to comply with on a voluntary basis. India will make all efforts to contribute to the realization of the global targets by improving the entire disaster management cycle in India by following the recommendations in the Sendai Framework and by adopting globally accepted best practices. The four priorities for action under the Sendai Framework are:

1. Understanding disaster risk
2. Strengthening disaster risk governance to manage disaster risk
3. Investing in disaster risk reduction for resilience
4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

The NDMP incorporates substantively the approach enunciated in the Sendai Framework and will help the country to meet the goals set in the framework. By 2030, the Sendai Framework aims to achieve substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries. The NDMP has been aligned broadly with the goals and priorities set out in the Sendai Framework for DRR. While the four cross-cutting Sendai priorities will be present explicitly or implicitly in every aspect of this plan, certain chapters will have specific priorities as the dominant theme. The plan includes measures that will be implemented over the short, medium, and long-term more or less over the time horizon of the Sendai Framework ending in 2030. The measures mentioned here are indicative and not exhaustive. Based on global practices and national experiences, the plan will incorporate changes during the periodic reviews and updates.

Vision

Make India disaster resilient, achieve substantial disaster risk reduction, and significantly decrease the losses of life, livelihoods, and assets – economic, physical, social, cultural, and environmental – by maximizing

the ability to cope with disasters at all levels of administration as well as among communities.

Multi-Hazard Vulnerability

India, due to its, physiographic and climatic conditions is one of the most disaster prone areas of the world. Vulnerability to disasters/emergencies of Chemical, Biological, Radiological and Nuclear (CBRN) origin also exists. Heightened vulnerabilities to disaster risks can be related to increasing population, urbanisation, industrialisation, development within high-risk zones, environmental degradation, and climate change. The DM Act of 2005 and DM Policy of 2009 consider disasters to be natural or human-induced for defining the roles and responsibilities. The human-induced category includes CBRN disasters. Besides, with the natural factors discussed earlier, various humaninduced activities are also responsible for accelerated impact and increase in frequency of disasters in the country. The NDMP covers disaster management cycle for all types of hazards faced in India – both natural and human-induced.

Reducing Risk; Enhancing Resilience

The role of the central agencies is to support the disaster-affected State or the UT in response to requests for assistance. However, the central agencies will play a pro-active role in disaster situations. In the domains of DM planning, preparedness, and capacity building, the central agencies will constantly work to upgrade Indian DM systems and practices as per global trends. The planning framework has arranged the actions envisaged for risk reduction under five thematic areas for action with one of the four priorities for action of Sendai Framework as its dominant feature.

For each hazard, the approach used in this national plan incorporates the four priorities enunciated in the Sendai Framework into the planning framework for Disaster Risk Reduction under the five Thematic Areas for Action:

1. Understanding Risk
2. Inter-Agency Coordination
3. Investing in DRR – Structural Measures
4. Investing in DRR – Non-Structural Measures
5. Capacity Development

For each thematic area for action, the NDMP has identified a set of major themes for undertaking actions within the broad planning framework. For each hazard, themes for action are presented in a separate responsibility matrix assigning roles of centre and state for each of the thematic areas for action. The activities envisaged in the NDMP and the Sendai Framework fall into short/ immediate (within 5 years), medium (within 10 years), and

long-term (within 15 years) categories, which will be implemented in many instances concurrently, and not necessarily sequentially. For both implementation and the realization of outcomes, they correspond to widely differing scope in terms of geographic spread, institutional complexity, and time scales. Some of the actions under immediate response are short-lived, while many of the measures for risk reduction and strengthening resilience are long term, which become part of all facets of developmental process through mainstreaming.

Response measures are those taken immediately after receiving early warning, anticipating an impending disaster, or post-disaster in cases where an event occurs without warning. The primary goal of response to a disaster is saving lives, protecting property, environment, and meeting basic needs of human and other living beings after the disaster. The immediate focus will be on search and rescue of those affected and to evacuate those likely to be affected by the disaster or secondary disaster that is likely to happen. In the section on response, roles, function and responsibilities of ministries and agencies that have a key role to play are described. Since contexts, knowledge base, and technologies change, DM plans must be updated periodically to reflect any changes in the key roles envisaged to particular ministries or agencies.

At the national level, the central government has assigned nodal responsibilities to specific ministries for coordinating disaster-specific responses. The NDMA will be coordinating with relevant nodal ministry. The disaster-specific nodal ministry will ensure liaison with the state government where the disaster has occurred and coordination among various relevant ministries and departments to provide quick and efficient response. The state government will activate the Incident Response Teams (IRT) at state, district, or the block level as required. The IRTs will coordinate with the state EOC. The SDMA1 (or its equivalent, CoR, or Dept. of Revenue) will provide technical support to the response.

Different central ministries and departments will provide emergency support to the response effort as per request from the State Government. It may be noted that the SDMA, Department of Revenue or Commissioner of Relief (as applicable) is the nodal agency for coordination of disaster response. The various agencies whose responsibilities are defined in detailed DM plans for the state and district will be responsible specific response measures. The DDMA is the nodal agency for coordination of response at district level supported by other district level agencies. The department wise specific activities at central ministries and state government are summarised in matrix providing clarity to the roles and responsibilities of various agencies.

Recovery and Building Back Better

Globally, the approach towards post-disaster restoration and rehabilitation has shifted to one of betterment reconstruction. While disasters result in considerable disruption of normal life, enormous suffering, loss of lives and property, global efforts consider the recovery, rehabilitation and reconstruction phase as an opportunity to build back better integrating disaster risk reduction into development measures, and making communities resilient to disasters. BBB is not limited to the built environment and has a wide applicability encompassing the economy, societal systems, institutions, and environment. The Sendai Framework envisages that the stakeholders will be prepared for BBB after a disaster. Existing mechanisms may require strengthening in order to provide effective support and achieve better implementation. Disaster recovery tends to be very difficult and long-drawn out. The reconstruction will vary depending on the actual disaster, location,

pre-disaster conditions, and the potentialities that emerge at that point of time. The NDMP provides a generalized framework for recovery since it is not possible to anticipate all the possible elements of betterment reconstruction.

Capacity Development

Capacity development covers strengthening of institutions, mechanisms, and capacities of all stakeholders at all levels. The plan recognizes the need for a strategic approach to capacity development and the need for enthusiastic participation of various stakeholders to make it effective. The plan addresses the challenge of putting in place appropriate institutional framework, management systems and allocation of resources for efficient prevention and handling of disasters. The planning needs of capacity development are described for all the four aspects of disaster management:

a. Prevention or mitigation to reduce risk from hazards
b. Preparedness for response
c. Effective response when disaster occurs
d. Ability to recover and build back better

Financial Arrangements

The financing of disaster relief has been an important aspect of federal fiscal relations. The primary responsibility for undertaking rescue, relief, and rehabilitation measures during a disaster lies with the State Governments. The Union Government supplements their efforts through logistic and financial support. The DM Act 2005 provides the legal framework for disaster management and all related matters, including the financial aspects. The Act envisages the constitution of two types of funds: response and mitigation, which are to be set up at the national, state and

district levels. Thus, for disaster response, the Act envisages a National Disaster Response Fund, a State Disaster Response Fund in each State and, within the States, a District Disaster Response Fund in each district. Similarly, the Act envisages a National Disaster Mitigation Fund, State Disaster Mitigation Fund and District Disaster Mitigation Fund for disaster mitigation. Section 47 of the DM Act 2005, pertaining to setting up of the National Disaster Mitigation Fund, has not been notified by the Government so far. The financing of the entire disaster management cycle will be as per norms set by the Government of India. The disaster risk reduction will be achieved by mainstreaming the requirements into the developmental plans.

Un Disaster Management

The United Nations Disaster Management Team (UNDMT) under the leadership of the UN Resident Coordinator works with diverse stakeholders, particularly key government departments, to integrate the objectives of Disaster Risk Reduction and Climate Change Adaptation into broader development plans and programmes, including those related to agriculture and natural resources, urban and rural habitats, infrastructure and service delivery.

Our Goals

The UNDMT partners with and provides technical support to government, civil society organizations, communities and other relevant stakeholders in their efforts to address the challenges of hazard and climate change impact in supporting an effective Climate Change Adaptation and Disaster Risk Reduction action to enhance community resilience.

In 2013, the UNDMT's work has focused on four key strategies:

- Capacity building,
- Knowledge Management,
- Advocacy and Policy, and
- Humanitarian Action

Key activities include: support to the establishment of a National Platform on Disaster Risk Reduction in India, contribution to the post 2015 Hyogo Framework dialogue, conduct of a South Asia Regional Consultation on Climate Change Adaptation, support risk informed development planning trough a Multi-Hazard Vulnerability Mapping system and support to the development of national guidelines on Public Health in Emergencies, Community Based Disaster Risk Reduction, Urban Risk Management and School Safety. In response to the devastating floods in Uttarakhand, the UNDMT provided technical support to the state government in the transition to recovery.

The **UN Secretary-General's message on the International Day for Disaster Reduction** on 13 October 2013 provides an opportunity to recognize the important role that persons with disabilities can play in disaster resilience initiatives and policy planning.

The Team

Convened by the **United Nations Children's Fund** (UNICEF), the UN Disaster Management Team brings together 13 UN agencies in India including **APCTT-ESCAP**, **FAO**, IOM **UNAIDS**, **UNDP**, UNICEF **UNESCAP**, **UNESCO**, **UNFPA**, **UN HABITAT**, **UNIDO**, **WFP** and **WHO** to improve the United Nation's emergency preparedness and disaster response.

(UNITED NATIONS IN INDIA)

Role of NGO

- Advocacy/ awareness
- Assessment/ Analysis
- Capacity Building
- Co- ordination and Partnership
- Miscellaneous like Shelter, Water availability, Sanitation, Conservation, Mock drills

14.2.3 Quality Assurance in Disaster Management

- Advisory Role
- Identify regulatory requirements
- Establish quality standards
- Consultation when preparing necessary documents

14.2.4 National Health Policy on Disaster Management Rights

Standard Operating Procedure for Flood

1. Description of the Threat/Event. Flooding occurs in known flood plains when there is prolonged rainfall over several days, intense rainfall over a short period of time, or because of ice or debris jams in a river. As a result, flooding can disrupt transportation systems and damage potable and wastewater systems and occupancies within the flood plain.

2. Impact on Mission Critical Systems. 1. Municipal utilities, including electrical power, water and natural gas. 2. Hospital normal and emergency electrical power distribution systems. 3. Hospital water distribution (potable and non-potable). 4. Sanitary sewer and storm drainage systems. 5. Natural gas supply and distribution system. 6. Medical gas (air, oxygen, nitrous oxide) and vacuum systems. 7. Diagnostic and therapeutic medical equipment. 8. Fire detection and suppression systems. 9. Voice and data communications (e.g. electronic patient records and images, cellular phones, telephones and paging systems). 10.Heating, ventilating and air conditioning systems. 11.Vertical and horizontal transport systems (elevators). 12.Refrigeration systems (e.g., blood bank, nutrition, laboratory, morgue). 13.Liquid fuel system s (e.g., propane, diesel, gasoline). 14.Roadways and bridges. 15.Waste handling and disposal (regular and bio-hazardous).

3. Contingency Plan

a) A command structure where role of each person should be defined (Annexure A).

b) A triage (screening) protocol wherein a triage officer should be identified for both field and hospital (Annexure B)

c) The plan should mention a place identified for using make shift hospital like community hall, school building etc. which can be used for treating casualties if they arise in large numbers exceeding the capacity of its health institutions (Annexure C).

d) Equipments, medicines, surgical materials and others (Annexure D).

e) Rapid first response team by mobile team for Crisis Management (Annexure E).

4) Operating units and key personnel with responsibility to manage this threat / Event As per Annexure A the key personnel will be responsible to manage the threat/event

5) Mitigation / Preparedness activities of the threat / event.

a. Hazard Control Strategies. The following are general control strategies needs to be adopted:

Remind employees about the dangers of driving in flood-prone areas. Check with suppliers for possible disruptions to utility services and deliveries. Reduce consumption of supplies known to be in limited supply. Contact home-based patients to check their status.

b. Hazard Monitoring Strategies.

Administration will monitor the flooding and its impact on roads and water systems

6) Response / Recovery from the event / threat.

Hazard Control Strategies. Comprises of four concurrent activities.

Save Lives and Prevent Injury. While it is important to set up the Emergency Operations Center as quickly as possible, it is urgent to address the safety of patients, particularly those who may be immobile or on life support. Clinical staff are key in this effort. As the Emergency Operations Center is set up and communication lines are established, information must be routed to the Emergency Operations Center with all possible speed as to the assessment of the injury and safety status of all patients.

Establish Communication Paths. Effective and timely communication is essential to minimize the loss of life or property.

Activate the Standard Operating Procedure for Patient Evacuations if needed. Special attention should be paid to begin the massive transportation needs and coordinate the safe transfer of patients by means of water ways on locally made boats.

Check and Secure Utility Systems. Include all components of distribution systems (e.g., supply and return lines, risers, shut-off and isolation valves, manifolds, switchgear, transformers and sub-stations) for the following lifeline utilities:

- Normal and emergency electrical power distribution systems.
- Water distribution (potable, chilled and irrigation).
- Sanitary sewer and storm drainage systems.
- Natural gas supply and distribution system.
- Steam generation and distribution systems.
- Medical gas (air, oxygen, nitrous oxide) and vacuum systems.
- Fire detection and suppression systems.
- Voice and data communications (e.g., electronic patient records and images, cellular phones, telephones and paging systems).
- Heating, ventilating and air conditioning systems.
- Vertical and horizontal transport systems (e.g., elevators).
- Refrigeration systems (e.g., blood bank, nutrition, laboratory, morgue, and research).
- Liquid fuel systems (e.g., propane, diesel, gasoline).

Check Your Progress

Note: a. Write your answer in the space given below
b. Compare your answer with those given at the end of the unit.

i. Expand NIDM and write the role of NIDM.
ii. What is the role of NGO?
iii. Which year was National Disaster Management Policy and National Disaster Management Plan was established?
iv. What are the four key strategies of UNDMT's?
v. What is the quality assurance in disaster management?

14.3 LET US SUM UP

This chapter deals with the capacity building, Government and NGO, spectrum of care, inter sectoral and coordinated care provision between organizations. In addition to it highlights the disaster preparedness, disaster resilience role of social workers in disaster services, policies and role of government sectors, role of state, central, un agencies, international organisations and NGO's in disaster management. So, that the awareness part is been imparted to overcome any type of disaster situation in future.

14.4 UNIT END EXERCISE

1. Explain the importance of Capacity building
2. Emphasize the roles and responsibilities of social worker in disaster service.
3. What are the policies and role of government sectors in disaster management?
4. Pen down the role of UN agencies.
5. Discuss the India disaster management plan
6. Write a note on quality assurance in disaster management
7. What are features of national health policy on disaster management
8. Describe disaster survivors and human rights.

14.5 ANSWER TO CHECK YOUR PROGRESS

i. The National Institute of Disaster Management (NIDM) is the capacity building arm and the States have disaster management cells in the State Administrative Training Institutes performs the function of capacity building for effective and efficient disaster management.

ii. Role of NGO:
   - Assessment/ Analysis
   - Capacity Building
   - Co- ordination and Partnership
   - Miscellaneous like Shelter, Water availability, Sanitation, Conservation, Mock drills

iii. National Disaster Management Policy- 2009 and National Disaster Management Plan – 2016

iv. The UNDMT's work has focused on four key strategies: Capacity building, Knowledge Management, Advocacy and Policy, and Humanitarian Action

v. Quality assurance in disaster management
   - Advisory Role
   - Identify regulatory requirements
   - Establish quality standards
   - Consultation when preparing necessary documents

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